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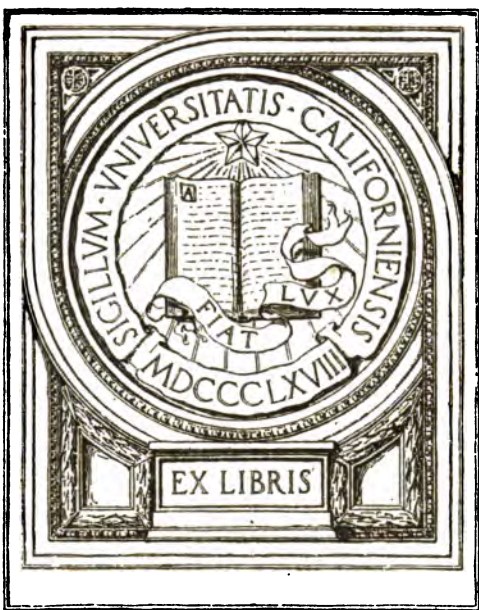
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INSTRUCTIONS FOR MOUNTING
USING, AND CARING FOR
DISAPPEARING CARRIAGE

L. F., MODEL OF 1898

FOR

6-INCH GUN

MODEL OF 1897 M1

(EIGHT PLATES)

REVISED MAY 17, 1904
REVISED NOVEMBER 28, 1911



WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

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**WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,**

Washington, November 28, 1911.

**This manual is published for the information and government of the Regular
Army and Organized Militia of the United States.**

By order of the Secretary of War:

**WILLIAM CROZIER,
*Brigadier General, Chief of Ordnance.***

(3)

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INSTRUCTIONS FOR MOUNTING, USING, AND CARING FOR DISAPPEARING CARRIAGE, L. F., MODEL OF 1898, FOR 6-INCH GUNS, MODEL OF 1897 M1

(EIGHT PLATES.)

[The points in *italics* are of importance or concern the safety of the carriage, and should be specially noted.]

GENERAL DESCRIPTION.

THE EMPLACEMENT (Pl. I).—Emplacements for these carriages are entirely of concrete and can be arranged for a maximum field of fire of 170° . This limitation is not due to the inability of the carriage to traverse through 360° , but to the requirements of parapet protection for the matériel and cannoneers. The anchor bolts are set in concrete during the construction of the emplacement, the depressions for the thrust plates being also provided in the top surface.

PRINCIPAL PARTS.—Base ring, azimuth circle; traversing-roller system; racer; chasis; transom; top carriage; recoil and counter-recoil system; gun levers; crosshead; counterweight; elevating arm; traversing, elevating, retracting, and sighting mechanisms; sighting platform; lanyard attachment; firing pistol; and accessories, including ammunition trucks, shot tongs, and implements.

ACTION OF CARRIAGE.—Upon firing the piece the gun-lever axle moves to the rear, carrying the top carriage with it. The lower ends of the levers move vertically upward, being constrained by the crosshead traveling in the vertical crosshead guides. The trunnions of the gun move downward and to the rear in the arc of an ellipse.

The energy of recoil is absorbed partly by raising the counterweight and partly by the movement of the masses up the inclined chassis rails, but principally by the resistance of the recoil cylinders; and when the gun comes to rest it has the proper loading angle of 5° . After loading, the pawls are tripped, and the excess of the moment of the counterweight over the moment of the gun, etc., enables it to raise the gun to the firing position. If this excess be small, the velocity of the counterrecoil will be slow; but if more counterweight be added, the velocity will increase, and the time required for going into battery will decrease.

BASE RING.—The base ring is made in one piece of cast iron, and is held in place on the foundation by twelve 1.75-inch bolts. Twelve bronze screws for leveling the base ring are provided near the foundation bolts. They are set against steel plates in the foundation and are used to level the carriage. The base ring, in addition to having the lower roller path on its upper surface, forms the pintle for the carriage, and is provided with 12 holes for filling the cavity beneath the roller path with grouting after the base ring is in place and leveled.

AZIMUTH CIRCLE AND POINTER.—A brass azimuth circle, attached by countersunk screws to the top of the pintle of the base ring, is graduated in degrees, the numbers of which are to be added after the carriage is erected in its emplacement. The top of the racer is cut away on the left side to expose the azimuth circle; the azimuth pointer and subscale are fastened to the racer. The subscale has slotted holes to give it a lateral motion for adjustment, after which it is fixed in position by two dowels. The subscale is graduated in decimals of a degree, the least reading being 0.01 of a degree. The whole (azimuth subscale and pointer) is protected by a hinged bronze cover.

RACER.—The racer is made in one piece of cast steel and has an outside diameter of 9 feet. On the underside there is an annular projection 1.25 inches thick, which is bored to fit inside a corresponding projection from the base ring, forming the pintle. The pintle surface of the racer is provided with an oil groove, and is lubricated through four holes from the top of the racer, closed by bronze screw plugs. The upper roller path is also formed on the underside of the racer.

TRAVERSING-ROLLER SYSTEM.—The racer rests upon a circle of 20 live, conical, traversing rollers running on the base ring. These rollers are equally spaced in distance rings of wrought iron, which are united and stiffened by 10 separators. The rollers are of steel, forged with a solid trunnion at each end and flanged on the inner end to hold them concentric with the base ring.

A dust guard, made of steel, arranged in four sections, protects the traversing rollers and is bolted to the racer.

CHASSIS AND TRANSOM.—The two chassis of cast iron are bolted to the racer and are united near their middle points by a cast-steel transom. The upper surfaces of the chassis rails form the recoil-roller path and slope 1° to the front to facilitate the return of the piece to the firing position, thus reducing the necessary preponderance of the counterweight.

TOP CARRIAGE AND RECOIL ROLLERS.—The top carriage is made of gun iron, cast in one piece, and consists of two side frames containing the beds for the gun-lever axles and two recoil cylinders,

all united by a transom: It rests upon two sets of 14 live recoil rollers, the trunnions of which run in bronze-bushed holes in the roller frames. The rollers are of forged steel, 3 inches in diameter, and are flanged on both ends to guide the top carriage upon the chassis rails. They move to the rear with the top carriage at one-half its speed and travel one-half as far.

RECOIL AND COUNTER-RECOIL SYSTEM (Pl. V).—The recoil cylinders are 6.5 inches in interior diameter, fitted with piston rods 2.5 inches in diameter, having pistons forged solid with them. The piston rods pass through lugs which project upward from the front ends of the chassis rails and are secured by the piston-rod nuts and check nuts. The piston rods project through the rear ends of the cylinders and are supported in rear by brackets bolted to the ends of the chassis rails. At the ends of the cylinders there are the usual stuffing boxes with glands and followers.

To secure equal resistance and equal fluid pressure in the two cylinders an equalizing pipe connects their front or pressure ends. In this pipe is an emptying coupling by which the whole recoil system can be emptied of oil. From this coupling a connecting pipe extends back to the throttling valve, and from this valve pipes connect with the rear ends of the cylinders.

The energy of recoil is taken up in small part only by the raising of the counterweight and by the movement of the top carriage up the inclined path, the greater portion being controlled and taken up by the resistance of the hydraulic cylinders.

In any hydraulic brake the resistance is increased as the velocity of the piston in the cylinder increases and as the opening for the passage of the liquid decreases. The velocity of retarded recoil of the top carriage being variable and a constant resistance being desired, the orifices are usually varied in such manner that the relation between the velocity and the area of the orifices is at all points such as to give a constant resistance.

The general arrangement of the hydraulic cylinders, pistons, equalizing and connecting pipes, throttling valve, and emptying coupling of disappearing carriages is shown on Plate V, to which these parts of this carriage conform in essential principles, features, and positions. The relative positions of parts shown on that plate are those which exist in the "in battery" position.

When the gun is fired the pistons remain stationary, while the top carriage (in which are the cylinders) moves to the rear. The motion of the top carriage is retarded and finally stopped principally by the resistance which the oil in the cylinders offers to being forced from one side of the piston to the other through the following openings:

1. The clearance between the walls of the cylinder and the piston necessary for working movement. This opening is of constant area.

2. The orifices between the throttling bars and their slots in the piston. These openings vary with the profile of the throttling bars, since the slots, which are partly closed by these bars, are of constant area.

3. The opening of the throttling valve which controls the flow through the pipes connecting the front and rear ends of the cylinders. This opening is of constant area during recoil, but can be completely closed or changed to suit different conditions of loading and to correct for any other conditions that would cause a variation in the length of recoil.

The two throttling bars in each cylinder are constructed of constant width, with only a sufficient lateral clearance in the slots for working movement, and of varying depth, the profile being so designed that the areas of the orifices (the portions of the slots not filled by the bars) for the escape of the oil past the piston are constant from the beginning of motion up to the point where the velocity of retarded recoil of the top carriage is greatest; beyond this point the velocity of retarded recoil of the top carriage is continually decreasing and the areas of the orifices decrease continually until they become zero at the end of recoil. The orifices have, at each point of the recoil, such a relation to the velocity of retarded recoil of the top carriage at that point as to give a constant resistance to the motion of the top carriage. This results in a constant fluid pressure in the cylinders.

The areas of the orifices have to be calculated for a particular set of conditions of loading, and any variation in these conditions will change the length of recoil of the top carriage, and consequently the height and inclination of the breech of the gun in the recoiled position. As the standard conditions of loading do not always exist, it has been found desirable to provide means for varying the resistance of the hydraulic recoil brake in order that the prescribed length of recoil (bringing the gun into the prescribed loading position) may be obtained under any conditions, standard or not standard, as, for example, when practice charges are fired.

For this purpose the equalizing pipes joining the two cylinders connect with a connecting pipe, affording a passage which can be completely closed or changed in area by the *throttling valve*, and by which the oil can pass from one side of the piston to the other, i. e., from one end of the cylinders to the other. *This throttling valve can be adjusted to give openings varying by 0.0066 square inch from 0 to 0.2 square inch.* The graduations of the valve are stamped on the top of the body, there being 11 divisions, numbered 0, 0.02, 0.04, etc. *One complete turn of the valve effects a change of 0.0133 square inch in the opening. One-half turn effects a change of 0.0066 square inch.*

The setting of the valve best suited to different conditions of loading, full or practice charges, etc., can be determined only by experience in actual firings with each particular carriage. Different carriages may require different settings, and the same carriage may even at different times require different settings for the same conditions of loading if it is in a materially different condition as to cleanness and lubrication of the working parts, etc. *It is necessary, therefore, that careful records be kept, not only of the setting of the valve, the conditions of loading and recoil, but also of the elevation of the piece and any abnormal condition of the carriage which might affect the freedom of its operation. These records should be studied in the light of all these circumstances to obtain perfect working.* However, the loading position may vary somewhat without material inconvenience, and it is generally possible after a few firings with a carriage to determine the settings of the valve which will result in the gun coming into a proper loading position for any conditions of loading. *For full charges the valve should, in the lack of experience with the particular carriage, be opened to about 0.05 square inch, but not more.*

A padlock is provided for locking the valve yoke in any position to guard against accidental or unauthorized changes in the position of the valve after it has been set. The valves should habitually be kept locked, but this should not be understood as discouraging examination and manipulation of the valve, which are, on the contrary, highly desirable for the sake of familiarizing the personnel with its construction and operation.

Each cylinder is provided with one filling plug, and an emptying plug is placed in the coupling of the equalizing pipe. In filling, the filling plugs should be removed from both cylinders so as to permit the air to escape and thus insure the filling of both cylinders up to the filling holes.

The portion of the cylinders above the level of the filling holes is intended to be empty, this being for the purpose of allowing the oil sufficient space in which to expand when heated by weather, or the friction developed in firing, and to compensate for the vacuum formed by the withdrawal of the counter-recoil buffer from its seat. This withdrawal is accomplished so rapidly in recoil that the oil can not flow through the small clearances with sufficient rapidity to fill the seat of the buffer without causing a high pressure in the cylinders.

For all charges, the cylinder should, before firing, be filled to the level of the filling holes; as above described.

A neutral oil, of specific gravity of about 0.85 (such as the "hydro-lene" at present issued), is used, and with this oil the working pressure in the cylinders is about 700 pounds per square inch. A denser

oil would cause a higher pressure in the cylinders and therefore shorten the recoil slightly. About 10.5 gallons of oil are required to fill the cylinders and pipes of one carriage.

For the purpose of reducing the shock of accidental excessive recoil, recoil buffers, made up of alternate layers of balata and steel plates, are placed on brackets bolted to the rear of the chassis, where they will be struck by the upper ends of the gun levers if the gun is retracted or recoils beyond its proper position.

The notches between the ratchet teeth cut on the front faces of the crosshead clips are numbered from the top, the numbers being opposite from the notches and stamped in the crosshead. When the pawl teeth engage in the nineteenth notch, the gun is in its calculated loading position, *below which it should not be retracted*. By a proper adjustment of the throttling valve, the recoil of the gun should not vary much from this position.

From the foregoing description of the recoil system *it should be evident that should the carriage recoil too freely, the proper correction is in diminution of the opening of the throttling valve, not in an increase of the counterweight. On the other hand, the counterweight alone should be changed to correct or modify the counter recoil.*

The amount of counterweight can be determined by trial. However much of the counterweight furnished be used, it will not materially affect the length of recoil.

Counter-recoil buffers are formed by annular projections from the rear cylinder heads fitting into corresponding recesses in the pistons with a diametral clearance of 0.008 of an inch.

When the gun returns to the firing position, the liquid caught in the recesses in the pistons can only escape by the small clearance, thus acting as a buffer to check the velocity at the end of the return into battery. At the front ends of the chassis rails counter-recoil stops are provided to prevent the bottoming of the annular projections in the piston recesses, and *against which the top carriage abuts when in the firing position.*

These counter-recoil buffers are now being replaced in carriages of this model by others having the male part on the piston rod and the female part in the cylinder head, and having a stroke about twice as long as the present buffers.

Lugs project from the lower front part of the top carriage, which serve as fulcrum for pinching bars held horizontally and engaging with teeth cast on the chassis rails, by which arrangement the top carriage may be removed forward to the firing position against the stops if from any cause it should fail to come fully into battery. When time permits, the top carriage should always be brought fully into battery (against the stops); but, if desired, the gun may be fired when the

top carriage is as much as 2 inches out of battery with perfect safety and with no bad results other than a slight inaccuracy in the elevation of the gun.

GUN LEVERS.—The trunnions of the guns rest in bronze-bushed trunnion beds in the upper ends of the gun levers.

These two levers are made of cast steel connected at a point a little below their middle by the forged-steel gun-lever axle, which is keyed to the levers. The gun levers are supported by this axle, the projecting ends of which serve as trunnions supported by and rotating in the bronze-bushed axle beds in the upper part of the side frames of the top carriage. They are secured therein by cast-steel axle caps, also bronze-bushed.

CROSSHEAD.—The lower end of the gun levers are connected by gun-lever pins to a cast-steel crosshead which supports the counterweight.

Crosshead clips formed in one piece with the crosshead are lined with bronze and engage over crosshead guides cast on the inside of the chassis. These guides constrain the crosshead to move in a vertical direction. Ratchet teeth are cut on the front faces of the clips, to be caught by pawls pivoted to the chassis, and in this way the counterweight is held up and the gun is prevented from returning to the firing position after recoiling.

TRIPPING GEAR.—After the gun is loaded it is permitted to rise to the firing position by raising one or both of the tripping levers until they are latched.

The tripping levers should not be held up by hand after the carriage starts into battery, as this would prevent their automatic release and return to their proper positions during the counter recoil; they are so designed as to be automatically brought to such position *during recoil* if for any reason they are not unlatched before firing, but this is not the desired action. The action is entirely automatic after the levers have been moved sufficiently to allow the carriage to start into battery, at which time they are caught by the safety latch so that the pawls are held out of the way of the rack until the latter has passed entirely below them, when they are released from the latches by the automatic action of the dogs attached to the crosshead, and are returned by the moment of weight of the tripping levers, etc., to their proper positions and are ready to engage the crosshead when it again rises.

COUNTERWEIGHT BOTTOM PLATE AND SUSPENSION RODS.—The cast-iron counterweight bottom plate and the two rods which suspend it from the crosshead form the cage which carries the lead counterweight. The counterweight is piled in the cage in layers of different thicknesses, each layer consisting of one or more pieces. There are 16 smaller pieces on top provided with rings for easy

handling. These weigh in all about 1,000 pounds. By adding or removing some or all of these smaller weights the counterweight can be readily increased or diminished. The total amount of lead counterweight furnished is 25 pieces, weighing approximately 19,100 pounds, and forming a pile, including bottom of cage, about 57 inches high.

The amount of lead counterweight sent with each carriage is designed to be about 600 pounds *in excess of that required to raise the gun to the firing position* under normal conditions. No matter what charge be fired the counterweight used should be such as will raise the gun completely to the firing position, but should never be such as to cause the top carriage to strike the counter-recoil stops with great shock. In its lowest position the counterweight hangs in a well formed in the concrete platform concentric with the base ring 77 inches in diameter and 53 inches in depth, measured from the underside of the base ring.

ELEVATING ARM AND RACKS.—The elevating arm is a single steel casting with bronze-bushed bearings at its upper ends for the elevating-band trunnions, and also at its lower ends for the elevating-rack journals. The elevating racks of cast steel are arcs of circles struck with 90 inches radii, using as centers the centers of the elevating-band trunnions when the gun is in the loading position. (The loading angle of the gun is about 5° .) The elevating racks work on guides bolted to the inner faces of the chassis.

A lug is cast on the rear part of each rack and two holes are drilled in each chassis in which stop bolts can be inserted and against which the lugs will strike to limit the depression of the gun to 0° or 5° , depending on the parapet over which the gun is to be fired.

A spring buffer is attached to each chassis near the bottom of the elevating-rack guides to prevent any shock, if by chance the racks run down of their own weight, and also to serve as an elastic stop for elevation.

ELEVATING SYSTEM.—In the front faces of the elevating racks are teeth in which pinions on the elevating-pinion shaft engage. This shaft runs in roller bearings in the chassis and in the elevating worm-wheel bracket, and carries on its left end an elevation disk, to the circumference of which is attached a white metal band, graduated in yards for service and subcaliber ranges, and every 5° for checking purposes.

An elevating pointer, in contact with the graduated plate, is fastened to the elevating worm-wheel bracket. This pointer has slotted holes for first adjustment, after which it is fixed by dowels.

The worm wheel is mounted on the elevating-pinion shaft inside the worm-wheel bracket and securely fastened to it by two square keys.

The elevating worm is mounted on the square section of the elevating-worm shaft. To the rear of the worm a strong helical spring is placed to keep the worm against its front bearing. If any downward force stronger than the spring pressure is exerted on the elevating rack the spring will be compressed, and when the force has ceased to act the spring will push the worm back to its original position and return the gun to its proper elevation. By this means any strains dangerous to the elevating mechanism during firing are avoided.

The elevating-handwheel shaft is supported in a bracket attached to the sight standard, is perpendicular to and connected with the worm shaft by bevel gears. On its outer end is the elevating handwheel. Near the center of this shaft is a second bevel gear which can be locked to it by a clutch operated by a clutch handle, and which meshes in another gear on the lower end of the maneuver elevating shaft. Attached to the upper end of the sight standard is a bracket carrying the elevating maneuver handwheel shaft, one end of which is connected with the maneuver elevating shaft by gears and on the other of which is the elevating maneuver handwheel. The gun can therefore be elevated or depressed by a cannoneer standing on the concrete foundation and using the elevating handwheel, or by a gunner on the sighting platform using the elevating maneuver handwheel. When using the former handwheel, the clutch should be thrown out to avoid the necessity of operating the elevating maneuver gear.

SIGHTING MECHANISM.—The telescopic sight is mounted in a bracket, the front end of which is pivoted at the top of the sight standard and the rear part of which is connected by means of a link system to a worm segment meshing with the operating worm. The shaft of this worm is joined by an adjustable coupling to the front end of the elevating worm shaft; consequently any rotation of the latter elevates or depresses the sight with the gun. By this system the line of collimation of the sight always has, when correctly adjusted by means of the coupling, the same angle of elevation as that of the gun.

SIGHT STANDARD AND PLATFORM.—The sight standard is made of gun iron, in one piece, and is bolted to the racer. The sighting gear is attached to it, most of the parts being assembled in its interior.

To this standard the sighting platform is attached at a height of 33.5 inches above the racer. It is supported at its front end by the sight standard and at its rear end by the sight-standard ladder. A railing surrounds the platform on three sides.

TRAVERSING MECHANISM.—A traversing crank on the left side of the carriage actuates through a train of gears a vertical shaft

supported in the racer. On the lower end of this shaft a pinion is formed which meshes in the traversing rack attached to the inner surface of the base ring below the pintle surface. The traversing crank is operated by a cannoneer standing on the concrete foundation, and is so placed that the operator can also read the azimuth circle.

A bracket attached to the sight standard carries the traversing maneuver handwheel, shaft, and a train of gears connected by a vertical shaft and other gears to the clutch shaft, thus enabling the carriage to also be traversed by the gunner on the sighting platform. A clutch is provided on the clutch shaft, so that when traversing by the crank the maneuver traversing mechanism can be unlocked and the necessity for operating it avoided. The clutch is operated by a handle on the exterior of the traversing-gear standard. The traversing and elevating maneuver handwheels are placed at a convenient height above the sighting platform for manipulation by the gunner while sighting; the elevating wheel is on the left and the traversing on the right side of the sight standard.

The gun can be elevated from -5° to $+15^{\circ}$, and the carriage permits of its being mounted in an emplacement in which the gun can be traversed through 170° . Stops on the base ring above the traversing rack limit the motion of the carriage in azimuth, depending upon the emplacement in which it is mounted.

There are plates on the carriage indicating the direction of motion of the elevating handwheels in elevating or depressing the gun, and that of the crank and handwheel for traversing.

The projectiles are brought to the gun on a shot truck carrying six projectiles. The truck is provided with wooden handles, and so constructed as to be easily operated by one man.

RETRACTING MECHANISM.—A crank is provided on the right side of the carriage which actuates through a train of spur gears a retracting shaft, the ends of which are supported in the chassis, and on which are placed two drums. From these drums wire ropes pass around guide pulleys at the rear end of the chassis rails and are hooked to the upper ends of the gun levers in the rear of the gun trunnions, thus enabling the gun to be retracted by hand from the firing into the loading position. The crank handle is maneuvered by cannoneers standing on the concrete foundation. The retracting ropes remain with the carriage, and when not in use should be wound upon the drums until their ends project but a few inches from the guide-pulley brackets. For safety, a dog and ratchet wheel are provided.

In hauling down, care should be exercised that the ropes are under *equal tension*. After taking up the slack in the ropes and putting some strain on them, they should be vibrated slightly, and, if found

to be unequally loaded, adjustment should be made at the rope clamps on the drums. After the loop of the rope is placed over the hook on the gun levers, and while winding up the slack, *special care should be taken that the rope is guided to the pulleys without kinks or slack, and that the coils lie smoothly upon the drums without crossing the ridges between the grooves.*

SAFETY LANYARD ATTACHMENT.—To prevent firing of the piece by a pull, accidental or otherwise, upon the lanyard before the gun has risen to the firing position, the lanyard is made in two parts, one from the primer to a ring attached to the safety device, the other from that ring to the loading platform of the emplacement, where it is to be pulled by a cannoneer. To the ring to which these two lanyards are attached is fastened a cord which passes around and is wound upon a reel carried in a housing attached to the rear face of the elevating band of the gun. A spiral spring causes this reel to rotate so as to wind up the cord and keep it wound up, unless it is pulled out against the action of the spring. This unwinding is prevented by the engagement, in ratchet notches on the reel, of a spring-actuated pawl, which is automatically released by a cam, attached to the rear face of the upper end of the elevating arm, when the gun has reached the firing position—that is, when it has been raised to such a height that the projectile will clear the parapet. As, before this, the reel can not turn, the wire cord can not unwind, and the short lanyard can not be pulled to the rear sufficiently to bring any pull whatever on the primer wire. The long halyard having no connection with the short one except through the ring on the wire cord coming from the reel, a pull upon this long lanyard does not affect the short lanyard or the primer until the pawl is released and the wire cord is pulled out against the resistance of the spring, at which time it is safe to fire.

CONDUITS AND WIRING.

All electrical conductors for the lighting, telephone, and telautograph circuits upon the carriage enter the counterweight well through a duct in the concrete, the opening of which is in the rear wall of the well a short distance below the base ring. The duct leads to a terminal box for the conductors, which is bolted underneath the base ring and located in a niche in the concrete. Attached to the lower end of the terminal box is a flexible metallic conduit, which contains all the conductors leading from the terminal box to the carriage.

This conduit hangs in a loop close to the bottom of the well so as to permit movement of the counterbalance device and to afford sufficient slack to permit traversing of the carriage through the allowed angle. The other end is secured to the vertical pipe conduit near

the center of rotation, thence the individual conductors are led to the several points at which their current is to be used. The wiring system, as shown on the diagram, is, as far as possible, inclosed in a conduit system of wrought-iron pipe, fittings, junction boxes, etc., all with interior insulation and outlet insulators at the ends of the pipes.

The conductors for the firing circuit are completely inclosed in flexible metallic hose, entirely separated from other wiring.

LIGHTING ARRANGEMENTS (Pl. VIII).—The power for lighting is obtained from the power mains of the emplacement. For general illumination of the carriage three 16-candlepower lamps in parallel controlled by one switch are provided. For illumination of azimuth pointer, elevation pointer, and throttling valve three 8-candlepower lamps are furnished. The azimuth and elevation pointer lamps are controlled by one switch; the throttling-valve lamp by a separate switch. On 220 volt mains these three lamps are placed in series and are controlled by one switch. A 16-candlepower portable lamp and plug box is provided by the Engineer Department and installed by the Ordnance Department. This lamp is controlled by a switch on the lamp.

THE FIRING CIRCUIT obtains its current from a dry cell battery, one wire from which leads through the safety firing switch to the "ground" near the breech of the gun; the other through the firing pistol and safety firing switch to the primer. Both wires lead up the gun levers and along the gun and are incased in flexible metallic conduits for protection. *The gun should be fired only by closing the circuit at the firing pistol after the circuit has been closed for both wires at the safety firing switch.* The pistol also contains an indicator to show that the circuit is in working order. This indicator consists of a contact piece, resistance spool, two electromagnets, and an anchor, to which the buzzer is attached. When the contact piece protruding at rear of the pistol frame is pushed in, the gun being prepared for firing, a current passes through the electromagnets and actuates the buzzer. This electric current is, on account of the resistance introduced, so weak that it can not ignite the charge in the electric primer.

The firing pistol is located near the top of the sight standard on the left side.

INSTRUCTIONS FOR ASSEMBLING THE CARRIAGE.

This requires machines and implements for mechanical maneuvers usually found at forts; but in addition to falls, blocking, jacks, sling chains, etc., a pair of shears, capable of lifting 5 tons, will be found especially useful. These are fully described in Tidball's Manual, page 284.

It may be stated generally that in assembling carriages no parts should be directly struck with a steel hammer, and that only copper drifts or copper or lead hammers should be used.

When two bearing surfaces are brought together it is especially necessary that both parts should be absolutely clean, smooth, and well lubricated.

The size and weight of the carriage permit it to be transported by rail to almost all locations partially assembled, so that when it arrives at its destination only a few of the larger parts have to be put in place, namely: Sight standard with ladder and platform, counterweight, suspension rods, base ring, racer, traversing rollers, dust guard, elevating band, and minor parts.

The following description refers particularly to the order in which the parts should be put together rather than to an enumeration of the details of the operation.

BASE RING.—Move the base ring to its position over the platform by means of skids and rollers. Place the thrust plates in position and lower the base ring by means of jacks until it rests on the platform with the bolts as nearly as central in the holes as possible.

A sensitive machinist's level and accurate steel straightedge should be used in leveling all parts.

The threads of the platform bolts should be carefully examined to see that they have not been burred in the operation of lowering, and that they are free from rust. After they have been put in good order, thoroughly oil the threads of both bolts and nuts before screwing on the nuts. In screwing down the nuts on the platform bolts take up on each a little at a time, so that no part of the base ring will be strained.

The greatest care must be exercised in using the "level" and "straightedge" that the middle of the level is equidistant from the

points of contact of the straightedge with the surfaces being leveled, and that these points of contact on the straightedge are equidistant from either end. The level should always be reversed and the mean considered the true reading.

After the base ring is properly leveled, pour under it a grouting of Portland cement.

After the grouting under the base ring has set firmly, the leveling screws should be unscrewed slightly to prevent their being strained in firing.

TRAVERSING ROLLERS AND DISTANCE RINGS.—Clean the lower roller path and the pintle surface with kerosene and emery cloth if necessary, after which place the rollers and distance rings in position and run them around several times by hand to see that they work freely. If there is any unreasonable binding, it must be remedied before proceeding.

RACER AND CHASSIS.—The racer with the chassis attached should now be moved over the base ring and lowered into position by jacks, care being exercised to keep the racer level in lowering to prevent the pintle surfaces from jamming together. After the racer is in position, carefully clean the rollers and roller surfaces, and put the dust guard in place to protect them from dirt while assembling the rest of the carriage.

COUNTERWEIGHT.—For the purpose of assembling the counterweight, block up to the top of the well. Carefully place the bottom plate in position and level it. Lower the pieces of counterweight into position with the shears, the complete disks first. The disks should be piled so that the holes are vertically above each other, and so placed that the suspension rods, after passing down through them, will engage the crosshead. Should any piece be burred or bent, this should be corrected before assembling it. Lower crosshead into position, engage it with suspension rods, and then put nuts on rods.

TOP CARRIAGE, GUN LEVERS AND GUN.—Move top carriage into proper position and engage crosshead with gun levers. The small counterweights should be piled later.

It is of great importance that each suspension rod should bear half the weight; therefore the nuts should be carefully adjusted to bring this about, and the length of the suspension rods should be carefully measured, so that one nut shall not be higher than the other.

The counterweight can now be lowered by jacks, bringing the tops of the levers to a convenient position for mounting the gun over the top of the parapet. The following method is, however, thought preferable: Jack the counterweight up until the levers are nearly in the recoiled position, being careful to follow the counterweight with blocking; mount the gun in place on the ends

of the gun levers, bolt the gun-lever cap-squares in place, and secure the muzzle of the gun to the crosshead by means of ropes.

Examine the stuffing boxes to see that they are properly packed and screw the followers up as tight as one man can comfortably do it with a spanner wrench. Remove all the filling plugs and fill the cylinders with oil.

ELEVATING BAND.—The elevating band can now be placed on the gun. To do this remove the bolts and open the ring until it will slip over the lug on the breech.

The band is in correct position when the centers of its journals are 55 inches from the center of the trunnions of the gun, measured parallel to the axis of the gun. This should be measured on both sides. After the band is properly placed screw up the bolts through the lugs and the set screws through the journals.

ELEVATING MECHANISM.—The elevating gear will ordinarily be found assembled when the carriage reaches its destination; if not, the following methods of assembling can be employed: If the elevating-rack guides are bolted in position, remove the elevating-rack buffers, engage the elevating racks and arm, and slide the racks over the guide from the bottom. This must be done before the chassis and racer are lowered into position on the base ring.

If the guides are not in position, engage the guides, racks, and arm; slide them into position from the rear, and fasten the guides in place.

The elevating wormwheel bracket is then bolted to the chassis and the sight standard fastened to the racer. The sight standard is shipped with most of the parts assembled. The elevating-pinion shaft is pushed through from the left side. When half through, the roller bearing that goes in the left chassis and both elevating pinions are put on, after which it is put in its final position and the pinions keyed to it.

A tooth should be numbered on the inside of each pinion to correspond with spaces on the elevating racks, and the mechanism will be properly assembled when these are brought together. Otherwise level across the trunnions of the elevating racks, engage the pinions, and key them to shaft without changing level of racks.

The wormwheel is next put on, and then the worm with ball-bearing washers and spring are assembled on the worm shaft and the rest of the gear fitted up.

TRAVERSING GEAR.—The traversing gear with standard is then put in order, and racer clips, platform, and other small parts put in place.

REMAINING PARTS.—The sighting platform and sight parallel mechanism should be assembled to the carriage.

The sight bracket on top of the sight standard must be placed in parallelism with the gun in the firing position. To do this bring the gun in battery and lay it in horizontal position, using a gunner's quadrant or a machinist's level. Put a sight in the sight bracket and loosen the coupling that connects the sight-operating worm with the elevating worm shaft. Turn the sight-operating worm, using a wrench on the square part projecting to the front of the sight standard, until the level on the sight indicates that the sight is in horizontal position. When this has been accomplished tighten up the coupling.

AFTER ASSEMBLING.—After the carriage has been assembled, the cylinders should be examined to see that they are correctly filled with oil. After all the bearing parts have been thoroughly cleaned and well lubricated, and the blocking under the counterweight has been removed, the pawls should be tripped and the gun allowed to rise to the firing position, to see that everything is working properly. The pieces in the top layer of counterweight should be added gradually until the amount required to raise the gun to the firing position without great shock on the counter-recoil stops has been determined, by allowing the gun to rise several times, each time with an increase of counterweight. *The retraction ropes should be detached after the gun is hauled down to the loading position and before it is allowed to rise again to the firing position.* Note that the retraction ropes are under equal tension when the strain is first brought upon them, so that when the gun levers in hauling down are nearly to the buffers the pawls will click together. *Do not attempt to retract the top carriage until the gun levers touch the buffers.* The carriage should also be traversed to its extreme positions against the azimuth stops, and the gun then hauled down to see that nothing will interfere with its recoil in these positions.

IMPORTANT POINTS.—After the carriage has been completely assembled and the gun mounted, the following points should be noted, viz:

1. See that all traversing rollers bear as the carriage is traversed throughout its extent.
2. Examine and clean out all oil holes.
3. See that each suspension rod has its full share of the counterweight.
4. See that the pawls, pawl safety device, and tripping levers act properly.
5. See that there is not a hard bearing between the rimbases of the gun and the gun levers.
6. See that the elevating arm and band are properly assembled.
7. See that the chassis rails and crosshead guides have not been burred.

8. See that the traversing pinion engages properly and that stops are properly placed to limit the motion of the carriage in azimuth.
9. See that the dust guard does not bear against the distance rings.
10. See that the counter-recoil buffers act properly when the gun rises to firing position.
11. See that the elevating-rack trunnions stand at same height on both sides of the carriage.
12. See that the piston rods are parallel to the tops of the chassis rails and also to the inside edges, that they are hard against their seats in front, and that the nuts are tight.
13. See that the followers of the cylinder heads are tight, and that those in rear do not bear against brackets when gun is in loading position.
14. See that the pawls engage in the racks properly and simultaneously.
15. See that the graduations of the azimuth circle are correct.
16. Verify the graduations for elevation.
17. See that the sight is in parallelism with the gun in the firing position.

CARE OF CARRIAGE.

GENERAL INSTRUCTIONS.—Carriages should be traversed from time to time throughout their entire allowed movement. They should not be allowed to stand for long periods at a particular azimuth, as this might cause uneven settling of the platform.

The habitual position of guns on disappearing carriages is "from battery," but at intervals the gun should be allowed to rise to the firing position and be elevated and depressed within the limits of the stops.

The action of the pawls should be tested before all firings to see that their action is not sluggish, due to weak springs or lack of lubrication.

It is required that all parts of carriages be kept free from rust at all times. If this be allowed to accumulate, its removal from bearing parts, and especially piston rods, requires particular attention in order that clearances may not be unduly increased. The use of sand-paper or coarse emery cloth for this purpose is forbidden. Emery cloth No. 1 should be used, the rust being softened, if necessary, by kerosene.

The retracting wire ropes should at all times be kept well oiled with light slushing oil.

If any leakage occurs from the hydraulic recoil system, it should be immediately remedied, calling if necessary upon the district armament officer for the services of skilled labor.

The repacking of stuffing boxes may be done, when necessary, by trained enlisted men under the supervision of an officer, but will preferably be done by skilled labor.

Before removing a cylinder head containing a stuffing box, or drawing a piston rod through a stuffing box, the pressure of the packing on the rod should be released by unscrewing the follower several turns.

The vulcanized fiber or copper gaskets between cylinders and their heads should be in good condition, and consequently should be replaced whenever necessary in order to prevent leakage.

Recoil cylinders should be emptied at least every three months and thoroughly cleaned every six months.

CLEANING RECOIL CYLINDERS.—For this cleaning a plumber's hand force pump will be supplied to each Coast Artillery post, with about 10 feet of suction hose and 15 feet of discharge tube.

In cleaning, the following order of operations may be followed:

(a) Run gun into battery and remove oil from hydraulic recoil system.

(b) Retract gun until pistons are in the middle of the cylinders; then slack away until the pawls engage in the ratchet teeth on the crosshead; observe that the pawls are properly engaged in the ratchet teeth, and that the pistons are not under the filling holes.

(c) Remove the piston-rod brackets from the rear ends of the chassis rails. Take off the two nuts on the front end of each piston rod, remove the rear cylinder head from each cylinder, and carefully remove the rods rearward out of the cylinders. Before removing any part it should be marked so as to insure its being reassembled in its correct position.

(d) Thoroughly clean each cylinder from both ends with kerosene oil forced in with a hand pump, then wipe dry with clean cotton waste. Clean the piston rods and stuffing boxes. The equalizing and connecting pipes should be thoroughly cleaned by forcing kerosene oil into them with the pump, permitting it to run out through the emptying hole. The throttling, recoil, and buffer valve stems should be removed from the body to facilitate this work.

(e) After the removal or evaporation of all kerosene oil, reassemble the parts and refill the cylinders with hydrolene oil, after which close the valves to their normal settings, carefully inspect all parts dismounted, and complete the retraction of the piece. It should not be tripped before again removing the oil plugs and adding any oil needed.

REMOVING PACKING FROM STUFFING BOXES (USING EXTRACTOR FURNISHED BY THE ORDNANCE DEPARTMENT).—Close the extractor around the piston rod and insert the locking pin. Turn the extractor to the left, with pressure on the packing, until the needles are firmly engaged in the packing. Draw the packing out, turning slowly to the left. In the case of a box with interior thread, if the ring is tight, it should be unscrewed and not stripped out by the thread, because unless unscrewed it would catch upon and be injured by the thread.

Extractor bars are provided to be used for starting the packing from its seat by inserting the toes of the bars in the rack teeth and prying over the edge of the box, being careful not to injure the thread.

REPACKING STUFFING BOXES.—Examine the old packing and discard all unfit for use. If any of the old packing is used, it should be put in after the new.

To repack, put on the piston rod one ring of 0.625-inch Garlock's "waterproof hydraulic" packing and force it well to the bottom of the stuffing box by a wooden stick and mallet. Treat each layer of packing in a similar manner, being careful to break the joints, until

six rings of packing have been inserted. Place the halves of the gland on the follower, enter them together in the box, and screw up the follower, being careful to note that the halves of the gland do not bind on the screw threads.

No more force should be used on the spanner wrench than that of two men, and generally that of one man is sufficient. The addition of a pipe to the end of the spanner wrench should not be permitted.

When the box is properly filled and the gland tightened, there should not be more than 1 inch of space between the flange of the follower and the piece into which it is screwed. The follower should be tightened from time to time. If the follower is screwed into the stuffing box too tightly, an unnecessary amount of friction will be produced on the piston rod. When the follower is screwed in until the flange strikes the box, another ring of packing should be inserted. It is expected that a slight amount of oil will soak through and drip from the stuffing boxes of carriages when not in use. This oil should be caught and not allowed to render the carriages unsightly. Also when tightening the followers a slight amount of oil will be squeezed out of the saturated packing.

SERVICE CONDITION (LUBRICATION, ETC.).—When the carriage is to be kept in readiness for service and is in daily or frequent use, all bearing parts must be kept thoroughly cleaned and lubricated. Especial attention should be given to the lubricating of trunnions, pintle surfaces, shaft-axle bearings, sliding surfaces, gun-lever axle bearings, crosshead pins, elevating racks, elevating-band trunnions, crosshead guides, and the elevating, traversing, tripping, sighting, and retracting mechanism, including the teeth of all gears.

The above parts should be lubricated at frequent intervals whether the carriage is maneuvered or not, and it is essential for the proper preservation and working of the carriage that on every day on which it is maneuvered for any purpose all bearings should be well lubricated immediately before such maneuvering.

Proper lubricating and cleaning of the traversing rollers and their paths are essential to free working of the carriage. The dust guards should be removed to oil the traversing rollers and to clean them and the paths.

Four oil holes, closed with brass screw plugs, are provided on the racer for oiling the pintle surface.

When oiling the pintle through these holes the carriage must be traversed in order to distribute the oil throughout the whole circumference.

It will occasionally be necessary to examine all ball and roller bearings to see that the dust guards are in proper place and that the rollers themselves are clean. If they be found dirty, they may

be flushed with kerosene oil; but care must be taken to fill the bearings with synovial oil after the kerosene has been drained away. If the rollers have rusted, the bearings must be taken out, the rollers cleaned, and the bearings reinserted.

RECOIL CYLINDER.—Experience has indicated that the oil should not be removed from the recoil cylinders when carriages are to remain unused for a considerable period, as the walls of the cylinders soon become dry and then rust.

OIL HOLES.—Oil holes, where provided, must be cleaned out frequently to keep them free from sand and grit, and will be kept closed by the screw plugs provided, except when in the act of oiling.

Before oiling at any oil hole wipe off carefully any dirt or grit near the opening that might be carried down into the bearing by the oil.

GREASE CUPS.—Where grease cups are provided, similar precautions against dirt or grit must be observed. In filling these cups do not fill the cup completely, but fill only to the bottom of the bevel at the top of the cup. If too full, the leather packing will not act as effectively. In putting on the cap see that the leather-packed follower enters the cup without being caught, cut, or bent by the edge of the cup or otherwise. Screw the cap down on the cup, using a wrench, if necessary, to secure sufficient power, until the spring rod projects about a quarter of an inch above the top of the cap. Later, when the spring has recovered and has moved the follower forward, forcing the grease through the tube into the bearings, which will be indicated by the spring rod being pulled into the cap until its nut touches, or nearly touches, the cap, it will again be necessary to screw up the cap on the cup until the spring is again compressed. When the cap is screwed nearly home and the spring rod does not project, it is an indication that the cup should be refilled.

For further information regarding paints, oils, cleaning materials, and methods of using same see Ordnance Department Pamphlet, Form No. 1869. Annual allowances will also be found in this pamphlet.

**LIST OF ARTICLES PACKED IN ARMAMENT CHEST FOR 6-INCH GUN, MODEL OF 1897
MI, AND DISAPPEARING CARRIAGE, MODEL OF 1898.**

[All articles marked * are carried loose in the chest.]

For gun.

- *1 box for firing mechanism.
- 3 brushes, cleaning, for primer seat in F. M. box.
- 1 cloth, emery, No. 00, 1 quire.
- 2 drifts, bronze, 1 large, U47AB, 1 small, U47AC.
- 1 drill, gunner's.
- 1 file, flat, dead smooth (8-inch).

- 1 file, half round, smooth (8-inch).
 - 1 file, round, second cut (8-inch).
 - 1 file, three-cornered (8-inch).
 - 1 hammer, boilermaker's.
 - 1 hammer, copper.
 - *1 lanyard, gunner's.
 - 1 mallet, hand.
 - *1 mallet, long-handled.
 - 1 pliers, cutting, 1 pair (7-inch).
 - *1 pouch, gunner's.
 - 1 punch, gunner's.
 - 1 punch, pin.
 - 1 reamer, cleaning, for primer seat in F. M. box.
 - 1 scraper, metal.
 - 1 screw driver, bar, for obturator nut and pinion pivot screw.
 - 1 screw driver, bar, for spindle key, gear-segment screws, etc.
 - 1 screw driver, bar, for sight bracket, etc.
 - 1 wrench, monkey (12-inch).
 - 1 wrench, monkey (15-inch).
 - *1 sleeves, gunner's, 1 pair.
 - *3 sponges, wagon.
 - 1 tray, loading.
 - *4 twine, assorted, 4 balls.
 - *Waste, cotton, 10 pounds.
 - *2 wire, copper, No. 12, pounds.
 - *2 wire, copper, No. 10, pounds.
 - 3 files, pillar, No. 6 (6-inch).
 - 3 files, 3-cornered, No. 4 (6-inch).
 - 3 files, round, smooth (8-inch).
 - 3 files, half-round, smooth (8-inch).
- } To be used on bruised breech blocks;
no other files to be used thereon.

For carriage.

- 2 extractors for cylinder head.
 - 1 extractor for gun-lever and suspension-rod pins.
 - 2 hooks, counterweight.
 - 2 oilers, half pint.
 - *1 oiler, locomotive, 1 quart.
 - 1 screw driver, commercial (3-inch blade).
 - 1 screw driver, commercial (5-inch blade).
 - 2 screw drivers, steel.
 - 1 wrench, box, for filling plugs.
 - 1 wrench, double, .125 and .25 nuts.
 - 1 wrench, double, .5 and .75 nuts.
 - 1 wrench, double, .875 and 1.0 nuts.
 - 1 wrench, single, 1.25 nut.
 - 1 wrench, single, 1.5 nut.
 - 2 wrenches, single, for piston-rod nut (2.0).
 - 1 wrench, spanner, for stuffing box.
- The following articles being too large are not to be kept in chest:
- 2 pinch bars.
 - 2 water buckets, indurated fiber.

For all small screws use commercial screw drivers issued with carriage.

*List of implements furnished with each 6-inch R. F. gun, model of 1879 M1,
mounted on disappearing carriage, model of 1898.*

- 1 rammer and staff.
- 1 sponge and staff, bore.
- 1 breech cover.
- 1 tomplion and muzzle cover.
- 1 sponge cover, bore.
- 1 slush brush with handles to connect with sponge staff.
- 1 steel scraper and socket to fit sponge staff.
- 1 sponge staff for slush brush and steel scraper.

Gaskets and packing.

- 20 rings Garlock's waterproof hydraulic packing, 0.625 inch square and 2.5 inches inside diameter.
- 4 rings Garlock's waterproof hydraulic packing, 0.25 inch square and 1 inch inside diameter.
- 1 set gaskets for all joints requiring them.

Weight of the principal parts of 6-inch disappearing carriage, L. F., model of 1898.

Name.	Pounds.
Base ring-----	4, 810
Racer-----	3, 400
Distance rings, complete-----	600
Traversing rollers, each-----	33
Chassis, each-----	2, 980
Transom-----	345
Set of recoil rollers and frame, one side-----	208
Top carriage-----	2, 550
Piston rods, each-----	225
Suspension rods, each-----	125
Counterweight, bottom plate-----	1, 890
Counterweight, dead weights-----	19, 100
Crosshead-----	860
Gun levers, each-----	1, 114
Gun-lever axle-----	426
Sight standard, with mechanism and platform-----	1, 485
Traversing gear standard-----	102
Elevating rack guides, each-----	75
Elevating racks, each-----	125
Elevating arm-----	520
Elevating band-----	180
Total weight of carriage-----	49, 190
Two shot trucks, 200 pounds each-----	400
Seven shot tongs, 10 pounds each-----	70
Implements-----	100

Names of the parts of 6-inch disappearing carriage, L. F., model of 1898, with their location and the material of which they are made.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				<i>Ins.</i>	<i>Ins.</i>		
Azimuth circle.....	On base ring.....	Brass.....	1				In 6 sections. With 2 dowel pins, 0.31 inch diameter.
Azimuth pointer....	On racer.....	Bronze.....	1				
Azimuth-pointer hinge pin.	For hinge.....	Steel.....	1				
Azimuth-pointer index.	Azimuth pointer.....	Bronze.....	1				
Azimuth-pointer lid.	To hinge on racer.....	do.....	1				
Azimuth-pointer lid hinge.	On racer.....	do.....	1				
Azimuth-pointer nut.	On azimuth - pointer screw.	do.....	1				Single L. H. thread, 0.1175 inch lead.
Azimuth-pointer screw.	Azimuth pointer.....	do.....	1				Single L. H. thread, 0.1175 inch lead, with collar.
Azimuth-pointer slide.	do.....	do.....	1				
Ball thrust bearings	On worm shaft.....	Steel.....	2				One 2-inch bore and one 1.375-inch bore; twenty-one 0.375-inch steel balls.
Base ring.....	On concrete platform.	Cast iron.....	1				
Bolts (hexagonal head).	Racer clip to racer.....	Wrought iron.	4	1	3		
Do.....	Dust guard to racer.....	do.....	36	0.5	1		
Do.....	Dust-guard joints.....	do.....	16	0.5	0.625		
Do.....	Traversing bear stand-ard.	do.....	4	1	2.75		
Do.....	Suspension-rod nuts.....	do.....	8	0.5	2		
Do.....	Chassis to racer.....	do.....	36	1	3.25		
Do.....	Equalizing pipe straps.	do.....	2	0.5	1		
Do.....	Throttling bars to recylinders.	do.....	24	0.625	2		Special, with lead washers.
Do.....	do.....	do.....	4	0.625	2.5		Do.
Do.....	Recoil-buffer brackers to chassis.	do.....	2	1.5	7.4	2	Do.
Do.....	do.....	do.....	4	1.25	7.1	4	
Do.....	Piston-rod brackets to chassis.	do.....	4	1	2.75		
Do.....	Transom to chassis.....	do.....	12	1	2.75		
Do.....	Elevating band.....	do.....	2	1.5	11.75	2	8 threads per inch.
Do.....	Elevating bracket cover.	do.....	6	0.5	1.5		
Do.....	Elevating wormwheel bracket to chassis.	do.....	8	1	3		
Do.....	Sight standard to racer	do.....	11	1	3		
Do.....	Elevating handwheel shaft bracket.	do.....	4	0.75	2		
Do.....	Elevating maneuver shaft bracket.	do.....	2	0.75	1.75		
Do.....	Worm-shaft coupling.	Steel.....	2	0.5	1.3		
Do.....	Sight-standard ladder.	Wrought iron.	2	0.75	1.5		
Do.....	Emptying coupling.....	do.....	2	0.75	2		
Do.....	Throttling valve.....	do.....	2	0.75	2		
Do.....	Elevating maneuver gear bracket.	do.....	2	0.5	2.5		
Do.....	do.....	do.....	1	0.5	1.25		
Do.....	Traversing maneuver gear bracket.	do.....	3	0.5	1.25		
Bushing.....	Tripping lever.....	Bronze.....	2				
Do.....	Traversing compound gear.	do.....	1				
Do.....	Left-hand chassis.....	do.....	1				
Do.....	Elevating bracket cover.	do.....	1				
Do.....	Elevating wormwheel bracket.	do.....	1				
Do.....	Elevating handwheel shaft bracket.	do.....	1				
Do.....	Traversing gear stand-ard.	do.....	2				
Do.....	In lower ends gun levers.	do.....	2				
Do.....	Upper ends gun levers.	do.....	2				4 halves.
Do.....	Right-hand chassis.....	do.....	3				

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Bushing.....	Gun-lever axle bearings	Bronze.....	2	<i>Ins.</i>	<i>Ins.</i>		4 halves.
Do.....	Recoil roller frames.....	do.....	56				
Do.....	Elevating arm, lower end.	do.....	2				
Do.....	Sight standard.....	do.....	2				
Chassis.....	On racer.....	Cast iron.....	2				Right and left sides.
Counterweights.....	Suspended from cross-head.	Cast lead.....	16				Top group.
Do.....	do.....	do.....	4				Second layer.
Do.....	do.....	do.....	1				Third layer.
Do.....	do.....	do.....	4				Fourth to seventh layer, inclusive.
Counterweight bottom plate.	do.....	Cast iron and cast lead.	1				
Counterweight handles.	In detachable pieces.....	Wrought iron.....	16				
Counterweight hooks.	With carriage.....	Steel.....	2				
Crosshead.....	Connecting counterweight to gun levers.	Cast steel.....	1				
Crosshead liners.....	In crosshead.....	Tobin bronze.....	12				
Direction plate.....	On traversing gear standard.	Bronze.....	1				For clutch.
Direction plate for retraction.	On side of right chassis.	do.....	1				
Direction plate for traversing.	On traversing gear standard.	do.....	1				
Direction plates for elevation.	On elevating hand-wheel.	do.....	2				
Distance ring.....	At traversing rollers, inner ends.	Wrought iron.....	1				
Do.....	At traversing rollers, outer ends.	do.....	1				
Dust guard.....	For traversing rollers.	Steel plate.....	1				
Dust guards.....	On sight standard.....	do.....	2				
Elevating arm.....	Connecting elevating band to elevating racks.	Cast steel.....	1				
Elevating-arm boxes.	Upper end of elevating arm.	Bronze.....	2				
Elevating band.....	On breech of gun.....	Cast steel.....	1				
Elevating band set screws.	Elevating band trunnions.	Steel.....	2				
Elevating bevel gear.	On elevating hand-wheel shaft.	Bronze.....	1				45 teeth, 6 pitch.
Do.....	On elevating worm shaft.	do.....	1				26 teeth, 4 pitch.
Elevating bevel pinion.	On maneuver elevating shaft.	Steel.....	1				15 teeth, 6 pitch.
Do.....	On elevating hand-wheel shaft.	Bronze.....	1				20 teeth, 4 pitch.
Elevating bracket cover.	On worm-wheel bracket.	Cast iron.....	1				
Elevating clutch....	On elevating hand-wheel shaft.	Bronze.....	1				
Elevating clutch handle.	Clutch-handle stud....	Steel.....	1				
Elevating clutch-handle stud.	On elevating hand-wheel shaft bracket.	do.....	1			1	
Elevating graduation strips.	Around elevation disk.	Brass.....	1				
Elevating hand-wheel.	On elevating hand-wheel shaft.	Wrought and cast iron.	1				
Elevating hand-wheel shaft.	Elevating handwheel shaft bracket.	Steel.....	1		14.875		
Elevating hand-wheel shaft bracket.	On sight standard.....	Cast iron.....	1				
Elevating maneuver bevel gear.	On maneuver elevating shaft.	Bronze.....	1				52 teeth, 8 pitch.
Do.....	On elevating maneuver shaft.	do.....	1				32 teeth, 8 pitch, with pin.
Elevating maneuver bevel pinion.	On elevating maneuver handwheel shaft.	Steel.....	1				15 teeth, 8 pitch, with pin.
Elevating maneuver bevel pinion and shaft.	Elevating maneuver gear bracket.	do.....	1		8.75		13 teeth, 8 pitch, with loose ring, pin, and key.

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Elevating maneuver gear bracket.	On sight standard.....	Bronze.....	1	<i>Ins.</i>	<i>Ins.</i>		
Elevating maneuver gear cover.	.....do.....	.....do.....	1				
Elevating maneuver handwheel shaft.	Elevating maneuver gear bracket.	Steel.....	1		67.05		With key.
Elevating maneuver shaft bracket.	On sight standard.....	Cast iron.....	1				
Elevating pinions.	On elevating pinion shaft.	Bronze.....	2				19 teeth, 1.25-inch circular pitch.
Elevating pinion shaft.	Through chassis.....	Forged steel...	1		70.5		With keys.
Elevating racks.....	On guides on chassis..	Cast steel.....	2				1 right hand, 1 left hand.
Elevating rack buffers.	Below elevating racks.	Wrought iron.	2			2	2 steel washers.
Elevating rack buffer springs.	Elevating rack buffer..	Steel.....	2				
Elevating rack buffer-springs bolts.	.....do.....	Wrought iron.	2	0.75		4	
Elevating rack guides.	Bolted to chassis.....	Bronze.....	2				
Elevating rack stops.	On inside of chassis...	Steel.....	2				
Elevating thrust nut bearing.	Worm-wheel bracket..	Bronze.....	1				
Elevating worm....	On worm shaft.....	Steel.....	1				1.25-inch lead, double left-hand threads.
Elevating worm shaft.	Worm-wheel bracket..	.....do.....	1		42.75		
Elevating worm-shaft coupling.	Connect worm shaft with sight-operating worm.	.....do.....	1				
Elevating worm spring.	On worm shaft.....	Spring steel...	1				
Elevating worm washer.	.....do.....	Steel.....	1				Between worm and spring.
Elevating worm wheel.	On elevating pinion shaft.	Bronze.....	1				38 teeth.
Elevating worm-wheel bracket.	On left chassis.....	Cast steel.....	1				
Elevation disk.....	On left end of elevating pinion shaft.	Cast iron.....	1				
Elevation pointer...	On worm-wheel bracket at elevation disk.	Brass.....	1				
Emptying coupling.	Top carriage.....	Bronze.....	1				
Emptying followers	Emptying coupling.....	.....do.....	3				
Emptying plug.....	.....do.....	Steel.....	1				
Equalizing pipe.....	On top carriage connecting recoil cylinders.	Copper.....	1				In 5 parts.
Equalizing-pipe collars.	On ends of equalizing pipe.	Brass.....	10				Brazed on pipe.
Equalizing-pipe followers.	Connecting equalizing and throttling pipes to recoil cylinders.	Bronze.....	4				
Equalizing-pipe rings.	On ends of equalizing pipe.	Steel.....	10				Free.
Equalizing-pipe straps.	Securing equalizing pipe to top carriage.	Wrought iron.	2				
Extractor.....	For gun-level and suspension-rod pins.	Steel.....	1				
Extractors.....	For cylinder head.....	.....do.....	2				
Filling plugs.....	On top of recoil cylinders.	Bronze.....	12				6 in reserve.
Gun levers.....	Carrying gun.....	Cast steel.....	2				1 right, 1 left.
Gun-lever axle.....	Uniting gun levers.....	Forged steel...	1				
Gun-lever caps.....	At upper ends of gun levers.	Cast steel.....	2				
Gun-lever pins.....	Crosshead to gun levers	Forged steel...	2	7.95	7.95		
Gun-lever pin covers	On crosshead.....	Cast iron.....	2				
Leveling screws....	In base ring for leveling	Bronze.....	12	1.5	2.5		
Leveling thrust plates.	Under base ring, for leveling screws.	Steel.....	12				

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Maneuver hand-wheels.	On elevating maneuver shaft and traversing maneuver gear.	Bronze.	2	<i>Ins.</i>	<i>Ins.</i>		Handles with brass sleeves.
Name plate.	On right chassis.	do.	1				
Oil cans.	With carriage.	Brass.	2				1 pint.
Oil can, with valve.	do.	do.	1				1 quart.
Padlock.	Throttling valve.	Bronze.	1				Yale standard padlock, No. 853.
Pawls.	Front of chassis for crosshead.	Forged steel.	2				
Pawl fulcrums.	Chassis.	do.	2			2	1.25-inch nuts.
Pawl springs.	Pawl to spring pivot.	Spring steel.	2				
Pawl-spring pivots.	Front end of both chassis.	Steel.	2				
Pinch bars.	With carriage.	do.	2		45.0		
Pinch-bar hook.	On right and left chassis.	do.	4				
Pistol bracket.	On sight standard.	Bronze.	1				
Pistons and rods.	In recoil cylinders.	Forged steel.	2		119.25		
Piston liners.	Pistons.	Bronze.	8				
Piston-liner pins.	In piston liners.	Steel.	16	0.25	1		
Piston-rod brackets.	On top of chassis.	Cast steel.	2				1 right, 1 left.
Racer.	On traversing rollers.	do.	1				
Racer clips.	On racer.	do.	2				
Recoil-buffer brackets.	On chassis.	do.	2				
Recoil-buffer caps.	Recoil buffers.	do.	2				
Recoil-buffer cap bolts.	do.	Steel.	4	0.75	10.75	4	With split pins.
Recoil-buffer cushions.	do.	Balata.	12				
Recoil-buffer plates.	do.	Wrought iron.	10				
Recoil rollers.	On top of chassis.	Forged steel.	28				
Retraction compound gear.	On retraction compound-gear stud.	Cast steel.	1				74 teeth, 4 pitch.
Retraction compound-gear stud.	Right chassis.	Forged steel.	1			2	With washer and pin.
Retraction compound pinion.	On retraction compound-gear stud.	do.	1				
Retraction crank.	On retraction pinion shaft.	do.	1				Handle with brass sleeve.
Retraction drums.	On retraction shaft.	Cast iron.	2				With set screws and 0.5 square keys.
Retraction ratchet.	On retraction pinion shaft.	Steel.	1				
Retraction hooks.	On gun-lever cap.	Forged steel.	2				1 right, 1 left.
Retraction pinion.	On retraction pinion shaft.	do.	1				24 teeth, 4 pitch.
Retraction pinion shaft.	Right chassis.	do.	1		13.66	1	With washer, pin, and key.
Retraction ratchet-wheel pawl.	On pawl pin.	Steel.	1				
Retraction ratchet-wheel pawl pin.	Right chassis.	do.	1		9.45	1	With washer and pin.
Retraction rope.	From gun levers to retraction drums.	Manila rope.	3				
Retraction rope sheave.	On recoil buffer.	Cast iron.	2				
Retraction rope sheave axle.	Recoil-buffer bracket.	Steel.	2		7.26		Each with washer and split pin.
Retraction shaft.	Through chassis.	Forged steel.	1		48.5		With keys.
Retraction spur gear.	On retraction shaft.	Cast steel.	1				53 teeth, 3 pitch.
Roller bearing.	Elevating maneuver shaft bracket.	Steel and bronze.	1	1.25	2		Diameter of shaft is given.
Do.	Elevating handwheel shaft in sight standard.	do.	1	1.25	2		Do.
Do.	Elevating worm-wheel shaft in sight standard.	do.	1	1.75	3.5		Do.
Do.	Elevating pinion shaft in right chassis.	do.	1	2.25	4.25		Do.
Do.	Elevating pinion shaft in left chassis.	do.	1	2.75	4.25		Do.
Do.	Elevating worm-wheel bracket.	do.	1	2.75	4.25		Do.
Do.	Retraction rope sheaves.	do.	2	1.25	3		Do.

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Roller bearing.....	Retraction shaft in left chassis.	Steel and bronze.	1	<i>Ins.</i> 1.75	<i>Ins.</i> 3.25	.....	Diameter of shaft is given.
Do.....	Retraction compound-gear stud.	.....do.....	1	1.75	5	.....	Do.
Do.....	Retraction shaft in right chassis.	.....do.....	1	2	3.25	.....	Do.
Do.....	Traversing clutch shaft in racer.	.....do.....	1	1	2	.....	Do.
Do.....	Maneuver traversing shaft in sight standard.	.....do.....	1	1.25	2	.....	Do.
Do.....	Traversing gear standard.	.....do.....	1	1.5	2.5	.....	Do.
Do.....	Traversing pinion shaft in racer.	.....do.....	2	2	3	.....	Do.
Roller-bearing dust guard.	On right chassis.	Steel and felt.	1	.....	.....	.....	2.3 bore.
Do.....	Retraction shaft.	.....do.....	1	.....	.....	.....	.....
Roller-frame end pieces.	At ends of roller frame.	Forged steel.	4	.....	.....	.....	1.8 bore.
Roller-frame pins.	Through end pieces.	Steel.	4	0.75	6.0	.....	.....
Roller-frame side pieces.	Embracing recoil rollers.	Forged steel.	4	.....	.....	.....	.....
Roller-frame stays..	Between sides of roller frame.	Steel.	26	.....	6	.....	.....
Rope fasteners.....	On retraction drum.	.....do.....	2	.....	.....	4	.....
Safety-latch dogs.	On crosshead.	Forged steel.	2	.....	.....	.....	1 right, 1 left.
Safety-latch fulcrums.	Chassis.	.....do.....	2	.....	.....	.....	.....
Safety-latch springs.	Safety latch to spring pivot.	Spring steel.	2	.....	.....	.....	.....
Safety-latch spring pivots.	Front ends of both chassis.	Steel.	2	.....	2.4	.....	.....
Safety-latch stops.	.....do.....	.....do.....	2	.....	.....	.....	.....
Screw drivers.	With carriage.	.....do.....	4	.....	.....	.....	2 with wood handle.
Screws, cheese-head.	Training rack.	Wrought iron.	42	0.5	1.2	.....	.....
Do.....	Gun-lever pin covers.	.....do.....	4	0.5	0.8	.....	.....
Do.....	Suspension-rod pin covers.	.....do.....	4	0.5	0.8	.....	.....
Do.....	Elevating guides.	.....do.....	18	0.75	2.35	.....	Body fit.
Do.....	Elevating rack stops.	.....do.....	2	1.25	1.5	.....	.....
Do.....	Piston stop.	.....do.....	1	0.375	.....	.....	.....
Do.....	Azimuth pointer.	Brass.	2	0.5	1.4	.....	.....
Screws, counter-sunk.	Roller-bearing dust guard.	Wrought iron.	6	0.375	1.15	.....	.....
Do.....	.....do.....	.....do.....	3	0.25	0.5	.....	.....
Do.....	Safety-latch stop.	.....do.....	4	0.5	1.1	.....	.....
Do.....	Distance-ring separators.	.....do.....	20	1	2.35	.....	.....
Do.....	Oil holes in racer.	.....do.....	4	0.625	0.9	.....	.....
Do.....	Azimuth pointer, lid hinge.	Brass.	3	0.5	1.25	.....	.....
Do.....	Azimuth circle.	.....do.....	42	0.25	0.6	.....	.....
Do.....	Gun-lever bushings.	.....do.....	16	0.375	1.25	.....	.....
Do.....	Crosshead liners.	.....do.....	8	0.5	1.1	.....	.....
Do.....	.....do.....	.....do.....	16	0.375	0.87	.....	.....
Do.....	Safety-latch dogs.	Wrought iron.	6	0.5	1.5	.....	.....
Do.....	Retraction hooks.	.....do.....	2	0.625	1.5	.....	.....
Do.....	Trunnion bed bushings.	Brass.	16	0.75	1.25	.....	.....
Do.....	Roller-bearing dust guard.	Wrought iron.	3	0.25	0.4	.....	.....
Do.....	Graduation strip.	Brass.	10	0.25	0.4	.....	.....
Do.....	Elevating wormwheel bracket.	Wrought iron.	3	0.25	2.25	.....	.....
Do.....	Sight-standard platform.	.....do.....	4	0.75	1.5	.....	.....
Do.....	Sight-standard ladder.	.....do.....	2	0.75	1.8	2	.....
Do.....	Traversing direction plate.	Brass.	2	0.25	0.6	.....	.....
Do.....	Elevating direction plates.	.....do.....	6	0.25	0.6	.....	.....
Do.....	Retraction direction plate.	.....do.....	2	0.25	0.6	.....	.....
Do.....	Index.	.....do.....	1	0.25	0.65	.....	.....
Do.....	Pistol bracket.	.....do.....	2	0.5	1.25	.....	.....
Do.....	Traversing gear cover.	.....do.....	4	0.25	0.65	.....	.....
Do.....	Elevating maneuver-gear cover.	.....do.....	2	0.375	1	.....	.....

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				<i>Ins.</i>	<i>Ins.</i>		
Screws, headless....	Retraction spur gear	Wrought iron.	1	0.5	0.75	.....
Do.....	Tripping shaft lever	do.	2	0.25	0.4	.....
Do.....	Traversing bevel gear	do.	1	0.5	0.75	.....
Do.....	Traversing gear	do.	1	0.75	0.75	.....
Do.....	Gun-lever pins	do.	2	0.5	0.75	.....
Do.....	Suspension-rod pins	do.	2	0.5	0.75	.....
Do.....	Roller frame	do.	68	0.375	0.7	.....
Do.....	Elevating handwheel	do.	1	0.5	0.75	.....
Do.....	Elevating bevel pinion	do.	1	0.5	0.75	.....
Do.....	Elevation disk	do.	1	0.5	0.75	.....
Do.....	Maneuver elevating handwheel	do.	1	0.25	0.5	.....
Do.....	Throttling-valve stem	do.	1	0.375	0.9	.....
Do.....	Traversing maneuver spur gear	do.	1	0.25	0.5	.....
Screws, headless, set.	Retraction drum	Steel	2	0.5	1.25	.....
Do.....	Crank-shaft collar	do.	1	0.5	0.6	.....
Do.....	Traversing maneuver shaft pinion	do.	1	0.375	0.45	.....
Do.....	Elevating bevel pinion	do.	1	0.375	0.5	.....
Do.....	Elevating worm-shaft collar	do.	1	0.5	0.75	.....
Do.....	Maneuver traversing shaft collar	do.	1	0.375	0.75	.....
Do.....	Maneuver elevating shaft collar	do.	1	0.375	0.75	.....
Do.....	Traversing maneuver gear-shaft collar	do.	1	0.25	0.4	.....
Screws, round-head.	Elevation pointer	Brass	2	0.375	0.8	.....
Do.....	Ball-thrust bearings	Steel	6	.....	.....	.....	Special.
Do.....	Dust guard	Brass	6	0.25	0.5	.....
Do.....	Core-hole cover	do.	6	0.25	0.5	.....
Do.....	Dust guard	do.	4	0.25	0.5	.....
Do.....	Sight-standard cover	do.	3	0.25	0.5	.....
Do.....	Name plate	do.	2	0.25	0.5	.....
Do.....	Traversing handwheel stud	Wrought iron.	1	0.25	0.8	.....
Separators.....	Between distance rings	Cast iron	10	.....	.....	.....
Shot tongs.....	With carriage	Steel	7	.....	.....	.....
Sight-connecting rod.	Inside of sight standard	do.	1	.....	.....	.....
Sight horizontal arm.	do.	Bronze	1	.....	.....	.....
Sight horizontal arm pin	Arm and parallel rod	do.	1	0.75	3.95	.....	With split pin.
Sight-operating segment.	Inside of sight standard	do.	1	.....	.....	.....	470 teeth in full gear, 0.125" circ. pitch.
Sight-operating segment pins.	On segment and sight bracket	do.	2	0.75	2.75	.....	With split pins.
Sight-operating worm.	Sight standard	Steel	1	.....	.....	.....
Sight-parallel rod...	Inside of sight standard	Steel and wrought-iron pipe.	1	.....	58.97	.....	Center to center.
Sight standard....	On racer	Cast iron	1	.....	.....	.....
Sight-standard core-hole covers.	On sight standard	Steel	2	.....	.....	.....
Sight-standard cover.	do.	do.	1	.....	.....	.....
Sight-standard ladder.	On racer	Wrought iron	1	.....	.....	.....
Sight-standard pin..	Segment-arm bracket to sight standard	Bronze	3	.....	7.45	3	
Sight-standard platform.	On sight standard	Rolled iron	1	.....	.....	.....
Sight-standard platform guard rail.	On sight-standard platform.	Wrought iron	1	.....	.....	8	1-inch pipe.
Stops.....	In base ring to limit traversing of carriage	Steel	2	.....	.....	.....
Studs.....	Rope fasteners	Wrought iron.	8	0.5	2.75	8	
Do.....	Gun-lever caps	do.	2	1.25	6	4	2 nuts 1.25 inches high, 2 nuts 0.625 inch high.
Do.....	do.	do.	2	1.25	6.6	4	
Do.....	Cap squares	do.	4	1.25	6.6	4	
Do.....	Rear stuffing boxes	do.	20	0.75	3	20	
Do.....	Elevating arm caps	do.	4	0.875	4.8	8	

Names of the parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Stuffing boxes.....	Front ends of recoil cylinders.	Bronze.....	2	<i>Ins.</i>	<i>Ins.</i>		
Stuffing-box follow-ers.	Stuffing boxes at rear and front of cylinders.	do.....	4				
Stuffing-box glands.	do.....	do.....	4				8 halves.
Stuffing-box heads..	Rear end of recoil cylinders.	do.....	2				
Suspension rods....	Crosshead.....	Steel.....	2				4 halves.
Suspension-rod nuts.	Suspension rod.....	Forged steel.	2				
Suspension-rod pins.	Crosshead to suspension rods.	do.....	2		7.95		
Suspension-rod pin covers.	On crosshead.....	Cast iron.....	2				
Telescopic sight bracket.	On sight standard....	Bronze.....	1				
Telescopic sight adjusting screws.	On sight bracket.....	do.....	2	0.375			With knurled head.
Telescopic sight clamps.	do.....	Steel.....	2				Japanned.
Telescopic sight clamp screws.	do.....	Bronze.....	2	0.25			
Telescopic sight locking screws.	do.....	do.....	2	0.375			With knurled head.
Throttling bars.....	In recoil cylinders.	Forged steel..	4				
Throttling-valve and stem.	Throttling valve.....	Bronze and steel.	1				
Throttling-valve body.	Top carriage.....	do.....	1				
Throttling-valve followers.	Throttling valve.....	Bronze.....	3				1 with 2-inch tap, 2 with 1.625-inch tap.
Throttling-valve gland.	do.....	do.....	1				
Throttling-valve latch.	do.....	do.....	1				
Throttling-valve seat.	do.....	Steel.....	1				
Throttling-valve yoke.	do.....	Bronze.....	1				
Top carriage.....	On chassis.....	Cast iron.....	1				
Training rack.....	Attached to base ring.	Steel.....	1				234 teeth, 3 pitch, in 6 pieces.
Transom.....	Between chassis.....	Cast steel.....	1				
Traversing bevel gear.	Maneuver traversing shaft.	Bronze.....	1				26 teeth, 6 pitch.
Do.....	On clutch shaft.....	do.....	1				22 teeth, 5 pitch.
Traversing bevel pinion.	Traversing maneuver gear shaft.	Steel.....	1				15 teeth, 6 pitch.
Do.....	On traversing crank shaft.	Bronze.....	1				20 teeth, 5 pitch.
Traversing clutch..	On clutch shaft.....	do.....	1				
Traversing clutch eccentric.	Clutch nut.....	Steel.....	1				
Traversing clutch handle.	On clutch eccentric..	do.....	1				
Traversing clutch nut.	Traversing gear stand-ard.	Bronze.....	1				
Traversing clutch shaft.	do.....	Steel.....	1		19.2		
Traversing clutch spring.	On clutch nut.....	do.....	1				
Traversing compound gear.	On clutch shaft.....	Cast iron.....	1				42 teeth, 5 pitch.
Do.....	do.....	Steel.....	1				12 teeth, 4 pitch.
Traversing compound pinion.	On traversing crank shaft.	do.....	1				Handle with brass sleeve.
Traversing crank..	Traversing gear stand-ard.	do.....	1		14.9		With collar and key.
Traversing crank shaft.	On traverse pinion....	Cast iron.....	1				52 teeth, 4 pitch.
Traversing gear....	Traversing gear stand-ard.	Bronze.....	1				
Traversing bevel-gear cover.	Racer.....	do.....	1				
Traversing spur-gear cover.	On racer.....	Cast iron.....	1				
Traversing gear standard.	On sight standard....	Bronze.....	1				
Traversing maneuver gear bracket.							

Names of parts of 6-inch disappearing carriage, etc.—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Traversing maneuver gear shaft.	Traversing maneuver gear bracket.	Steel.....	1	<i>Ins.</i>	<i>Ins.</i> 67.05	....	With collar and keys.
Traversing maneuver handwheel gear.	Traversing maneuver handwheel stud.	Bronze.....	1	.....	.....	.....	44 teeth, 8 pitch.
Traversing maneuver handwheel stud.	On sight standard.....	Steel.....	1	.....	4.76	.....	With washer, screw, and pin.
Traversing maneuver shaft pinion.	On maneuver traversing shaft.	.....do.....	1	.....	.....	.....	12 teeth, 5 pitch.
Traversing maneuver spur gear.	Traversing maneuver gear shaft.	Bronze.....	1	.....	.....	.....	80 teeth, 8 pitch.
Traversing pinion.	Racer.....	Steel.....	1	.....	.....	.....	12 teeth, 3 pitch.
Traversing rollers.	Between basering and racer.	Forged steel..	20	.....	.....	.....
Tripping arms.	On tripping shaft.....	.....do.....	2	.....	.....	.....	1 right-hand, bore 1.65; 1 left-hand, bore 1.55.
Tripping levers.	On tripping-lever fulcrum.	Cast steel.....	2	.....	.....	.....
Tripping-lever fulcrums.	Chassis.....	Forged steel..	2	.....	.....	.....
Tripping-lever stops	Rear ends of chassis..	Steel.....	4	.....	4.375	.....
Tripping rods.	Outside of both chassis connecting tripping levers.	Forged steel..	2	.....	.....	.....	Complete.
Tripping-rod pins.	Tripping rod to levers.	Bronze.....	4	0.75	2.15	.....	With split pin.
Tripping-safety latches.	On safety-latch fulcrum.	Forged steel..	2	.....	.....	.....
Tripping shaft.	At front end of chassis.	Steel.....	1	.....	48.0	.....	With keys.
Tripping-shaft levers.	On tripping shaft.....	Forged steel..	2	.....	.....	.....
Wrench.	For filling plugs.....	Steel.....	1	.....	.....	.....
Wrench, single.	For 1½-inch nuts.....	.....do.....	1	.....	.....	.....
Do.	For 1½-inch nuts.....	.....do.....	1	.....	.....	.....
Do.	For 2-inch nuts.....	.....do.....	2	.....	.....	.....
Wrench, double.	For ¾ and 1 inch nuts.....	.....do.....	1	.....	.....	.....
Do.	For ¾ and 1 inch nuts.....	.....do.....	1	.....	.....	.....
Do.	For ¾ and 1 inch nuts.....	.....do.....	1	.....	.....	.....
Wrench, spanner.	With carriage.....	.....do.....	1	.....	.....	.....

Electrical firing and lighting apparatus.

TERMINAL BOX AND FLEXIBLE HOSE.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(V19B)	1	Base.....	In terminal box (V19A).....	Slate.	6 by 15.375 by 1 inch.
(V19D)	1	.....do.....	For flexible metallic hose.....	S.	Secured to concrete by expansion bolts (V5R).
(V5V)	6	Bolts, tap.....	For cover (V19C).....	S.	0.625 by 1.5 inches.
(V5X)	4	.....do.....	Terminal box (V19A) to racer.....	S.	0.625 by 1.75 inches.
(V5M)	2	.....do.....	Securing strap (V5L) to base (V19D).	S.	0.75 by 1.25 inches.
(V5R)	2	Bolts, with nuts expansion	Securing hose strap to concrete..	S.	
(V5AB)	12	Bolts, special.....	Through slate base (V19B).....	Bz.	0.25 by 2.125 inches.
(V19C)	1	Cover.....	On terminal box (V19A).....	C. I.	
(V5AW)	2	Coupling nuts.....	On 2-inch flexible metallic hose.....	Bz.	
	1	Hose, flexible metallic, 2-inch.	From terminal box (V19A) to 2-inch loricated steel conduit in counterweight well.	S.	About 6 feet long.
(V5AV)	2	Hose fittings.....	On 2-inch flexible metallic hose.....	Bz.	Soldered on.
(V5AU)	12	Marking plates.....	On slate base (V19B).....	S. B.	
(V5AC)	36	Nuts.....	On bronze bolts (V5AB).....	Bz.	
	2	Pins.....	For terminal box fitting (V19E) ..	Bz.	Driven.
	2	.....do.....	For pipe fitting (V5S1) to 2-inch steel conduit.	S.	
	24	.....do.....	For marking plates in terminal box (V19A).	Br.	0.08 by 0.375 inch, commercial.

Electrical firing and lighting apparatus—Continued.

TERMINAL BOX AND FLEXIBLE HOSE—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(V5S1)	1	Pipe fitting.....	Connecting 2-inch flexible metallic hose with 2-inch loricated steel conduit in counterweight well.	Bz.	Pinned to steel conduits.
	3	Pipe plugs.....	In terminal box (V19A).....	C. I.	2.5-inch Standard, commercial.
(V5AL1)	1	Plate.....	do.....	Br.	Letters stamped on.
(V18H)	1	Rubber pad.....	do.....	S. R.	
(V5T)	2	Screws, round-head.	In rubber pad (V18H).....	Bz.	0.375 by 1 inch.
(V5AK)	4	do.....	In plate (V5AL1).....	Br.	0.187 ($\frac{3}{16}$) by 0.375 inch.
(V5L)	1	Strap.....	On base (V19D).....	S.	For securing flexible metallic hose.
(V19A)	1	Terminal box.....	In counterweight well.....	C. I.	Bolted to basering.
(V19E)	1	Terminal box fitting.	In terminal box (V19A).....	Bz.	Forced fit in box.
(V5AA1)	24	Terminals.....	do.....	C.	Soldered to conductors.
(V5AH)	2	Washers.....	For rubber pad (V18H).....	Bz.	0.75 by 0.375 inch by No. 16 (0.065 inch) thick.
(V5AD)	24	do.....	On bronze bolts (V5AB).....	Bz.	0.5 by 0.25 inch by No. 18 BWG.

LIGHTING CIRCUITS.

(E12R)	1	Azimuth lamp fitting.	In racer.....	C. I.	
	9	Bolts, tap.....	For straps (T59K).....	S.	
	1	do.....	For straps (T59F).....	S.	
	1	do.....	For straps (T59G).....	S.	
	6	do.....	For shades (T59C) and (T59J).....	S.	
	8	do.....	For junction boxes (T59A) and (T59H).....	S.	
	8	do.....	For junction box covers (T59B) and (T59M).....	S.	
	2	do.....	For plug box (E14B).....	S.	
	2	do.....	For portable lamp hook (E14C).....	S.	
(T59D)	1	Bolts, special U, with nuts.	Connecting braces to 2-inch conduit in counterweight well.	S.	
(T59L)	2	Braces.....	Securing 2-inch conduit on counterweight well.	W. I.	Pipe.
(E12S)	2	Caps.....	On modified lamp fitting (E13D).....	Bz.	1 only on carriages having 220-volt mains.
(E12V)	2	Couplings.....	do.....	Bz.	Do.
(V23AA)	6	Couplings, 0.5 inch, R. & L.	On 0.5-inch conduit.....	M. I.	Commercial.
(V23BA)	1	Couplings, 0.75 inch, R. & L.	On 0.75-inch conduit.....	M. I.	Do.
(V23CA)	2	Couplings, 1.25 inch, R. & L.	On 1.25-inch conduit.....	M. I.	Commercial, 1 only on carriages without outlet box.
	15	Conduit, flexible steel.	For portable lamp.....	S.	
	15	Conductor, No. 16 gauge.	do.....	C.	
(V23AJ)	4	Elbows.....	On 0.5-inch conduit.....	M. I.	Commercial.
(E14C)	1	Hook for portable lamp.	On left chassis.....	Bz.	
(T59H)	1	Junction box.....	On front transom.....	C. I.	
(T59A)	1	do.....	On left chassis.....	C. I.	
(T59M)	1	Junction box cover.	On junction box (T59H).....	C. I.	
(T59B)	1	do.....	On junction box (T59A).....	C. I.	
	3	Lamps 16 candle-power, 110-volt.	For lighting circuits on 110-volt mains.	.....	Do.
	3	Lamps 16 candle-power, 220-volt.	For lighting circuits on 220-volt mains.	.....	Do.
(E12NA)	3	Lamps 8 candle-power, 110-volt.	For lighting circuits on 110-volt mains.	.....	Do.
(E12M)	3	Lamps 8 candle-power, 74-volt.	For lighting circuits on 220-volt mains.	.....	Do.

Electrical firing and lighting apparatus—Continued.

LIGHTING CIRCUITS—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(E14A)	1	Lamp, portable...	Hung on left chassis.....	.....	Aluminum shade and handles furnished by Engineering division.
(E12Q)	3	Lamp, spring.....	In reflectors (E12P1).....	S. S.	Used on carriages with 220-volt mains only.
(T6J)	1	Lamp fitting.....	For 8 candlepower lamp at throttling valve.	C. I.	
(E13D)	2	Lamp fitting, modified.	For 8 candlepower lamp, 1 at elevation pointer and 1 at throttling valve.	C. I.	1 only (at elevation pointer) used on carriages having 220-volt mains. Right and left.
(V23FT)	4	Nipples, short, 0.5 inch.	For 0.5-inch conduit.....	W. I.	Do.
(V23GT)	1	Nipples, short, 0.75 inch.	For 0.75-inch conduit.....	W. I.	
(V23JT)	1	Nipples, short, 1.25 inches.	For 1.25-inch conduit.....	W. I.	
(V23AT)	2	Nipples, short, 0.5 inch.	For tees (V23BC).....	W. I.	Right.
(V23LT)	4	Nipples, close, 0.5 inch.	2 in junction box (T59H) and 2 in 0.5-inch conduit.	W. I.	Do.
(V23AW)	2	Nipples, chase...	On 0.5-inch conduit.....	.....	Commercial, Western Electric Co. No. 5056.
(E12T)	3	Nuts.....	For 8 candlepower lamp fittings..	Bz.	0.5-inch insulated.
	1	Pipe.....	From socket holder (E13AG) to tee (23AC) on left chassis.	W. I.	
	1	.....do.....	From tee (23AC) to junction box (T59H) on front transom.	W. I.	Do.
	1	.....do.....	From junction box (T59H) to 16 candlepower lamp on front transom.	W. I.	Do.
	1	.....do.....	From junction box (T59H) to elbow (T23AJ) leading to 0.5-inch conduit on top carriage.	W. I.	Do.
	1	.....do.....	From junction box (T59A) to tee (V23AC) on left chassis.	W. I.	Do.
	1	.....do.....	From tee (23AC) to plug box (E14B) on left chassis.	W. I.	Do.
	1	.....do.....	From tee (23AC) to lamp fitting (E13D) at elevation pointer.	W. I.	Do.
	1	.....do.....	From junction box (T59A) to azimuth pointer lamp.	W. I.	Do.
	1	.....do.....	On top carriage leading to throttling-valve lamp.	W. I.	Do.
	1	.....do.....	From junction box (T59A) to 16-candlepower lamp on sight standard.	W. I.	0.75-inch insulated.
	1	.....do.....	From tee (V23BC) to tee (V23BC) at sight standard.	W. I.	Do.
	1	.....do.....	From junction box (T59H) on transom to junction box (T59A) on left chassis.	W. I.	1.25-inch insulated.
	1	.....do.....	From junction box (T59A) to outlet box.	W. I.	1.25-inch insulated. Used only on carriages where outlet box is installed.
	1	.....do.....	From junction box (T59H) to flexible metallic hose in counterweight well.	W. I.	2-inch insulated.
(V23A)	3	Pipe plugs.....	In 0.5-inch tees.....	C. I.	Commercial.
(V23B)	1	.....do.....	In 0.75-inch tees.....	C. I.	Do.
(V23D)	1	.....do.....	In junction box (T59A).....	C. I.	Used only on carriages without outlet box.
(E14B)	1	Plug box.....	On left chassis.....	Bz.	Furnished by Engineering Department.
(E12P1)	3	Reflectors.....	For 8-candlepower lamps.....	S. B. T.	Commercial.
(E13AJ)	3	Receptacles, candleabra.	.....do.....	V. A.	
(T59C)	3	Shades, complete.	For 16-candlepower lamps.....	S.	Do.
(E13AH)	3	Sockets.....	In lamp fitting for 8-candlepower lamps.	Bz.	
(E13AF)	3	.....do.....	In socket holders (E13AG) for 16-candlepower lamps.	V. A.	

Electrical firing and lighting apparatus—Continued.

LIGHTING CIRCUITS—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(E13AG)	3	Socket holders....	For 16-candlepower lamps.....	Bz.	
(T59K)	9	Straps.....	For 0.5-inch conduit.....	S.	
(T59F)	1	do.....	For 0.75-inch conduit.....	S.	
(T59E)	1	do.....	On U bolt in counterweight well..	S.	
(E13Q)	1	Switch, Russell..	Near 16-candlepower lamp on sight standard.		Commercial.
(E13B1)	2	Switches, water-tight.	On modified lamp fitting (E13D).....		1 only (at elevation pointer) used on carriages having 220-volt mains.
(E13A1)	2	Switches, Perkins.	do.....		Do.
(V23AC)	4	Tees.....	2 on 0.5-inch conduit and 2 on junction box (T59H).	M. I.	0.5-inch commercial.
(V23BC)	2	do.....	On 0.75-inch conduit at sight standard.	M. I.	0.75 by 0.75 by 0.5 inch commercial.
(E13C)	2	Washers.....	On modified lamp fitting.....	S. R.	
	1	Wire.....	For lighting circuit.....	C.	Insulated.

BATTERY BOX.

(P45A2)	1	Battery box.....	In battery-box bracket.....	Oak.	Boiled in paraffin.
(P45B2)	1	Battery-box connections.	Secured to outside of battery box.	Bz.	Serve to join branches of firing circuit to battery.
	1	Battery-box bracket.	Underneath sighting platform....	S.	In 2 pieces.
(P45U1)	2	Bolts with nuts,...	Battery box to bracket.....	S.	
(P45K)	16	Bolts, tap.....	For straps (P45Q) and (P458).....	S.	
(P45W)	2	do.....	For battery-box connection (P45B2) to battery box (P45A2).	S.	Cs'k with washer under the nut.
(P45M3)	12	Bushings.....	For terminals of firing circuit.....	H. R.	
	6	Cells, dry battery.	In battery box (P45A2).....		O K. No. 4 or equal.
	5	Cell connections.	do.....		Insulated wire.
		Conduit, flexible..	For firing circuits.....	S.	About 70 feet.
(P45Z1)	1	Contact-fork connection.	For terminals of firing circuit.....	C.	
	5	Firing circuits, branches of.	Connecting various electrical firing apparatus.		Made up of terminals, insulated wire, and flexible conduits.
(P45F)	1	Ground connection.	On the gun.....	S.	
(P45V1)	4	Hasps and hooks, complete.	For battery box (P45A2).....	Br.	
(P45Y)	12	Lugs.....	In battery box (P45A2).....	C.	For cell connections.
(P45C1)	2	Nipples.....	For battery-box connections (P45B2).	Bz.	
	2	Nuts.....	For bolts (P45W).....	S.	
(P45H)	10	do.....	For swivels (P45G1).....	Bz.	
(P45T)	10	Plugs.....	In branches of firing circuits.....	Bz.	
	1	Packing.....	In battery box.....	F.	Between cells, in sections.
(P45P1)	9	Receptacles.....	In branches of firing circuits.....	Bz.	
(P45N1)	12	Sockets.....	do.....	Bz.	
(P45J1)	10	Sleeves.....	do.....	Bz.	
(P45Q)	12	Straps.....	For firing circuits.....	S.	
(P458)	2	do.....	do.....	S.	
(P59G)	1	do.....	do.....	S.	
(P45G1)	10	Swivels.....	In branches of firing circuits.....	Bz.	
	2	Terminal connections.	In battery box.....	C.	Insulated No. 14, B. & S. gauge.
(P45AA1)	12	Washers.....	In branches of firing circuits.....	H. R.	
(P45X)	2	do.....	For battery-box connections.....	S.	
		Wire No. 14.....	For firing circuits.....	C.	Insulated, about 70 feet.

*Electrical firing and lighting apparatus—Continued.***FIRING PISTOL AS PER DRAWING 14-5-39.**

[To be used in replacement of firing pistols as shown on drawing 7-3-26 when complete new pistols are required.]

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(P39D1)	1	Binding bolt with 4 nuts.	In spring insulation (P39H4).....	Br.	•
(P39J)	1	Binding post.....	In buzzer board.....	Br.	
(P39X)	1	do.....	do.....	Br.	
(P39S)	2	Binding-post cables.	From binding bolt (P39D1) and from binding stud (P39AB) to binding post (P39J) and spiral screw (P39AM3).	C.	Insulated.
(P39W2)	2	Binding-post screws.	1 for binding post (P39J) and 1 for binding post (P39X).	S.	
(P39AB)	1	Binding stud with nut.	In spring insulation (P39H4).....	Br.	
	2	Bolts, tap.....	For firing-pistol bracket.....	S.	See dr. 7-3-20, rev. Oct. 1, 1909.
(P39F1)	2	do.....	1 in magnet header (P39AE) and 1 in spiral (P39AJ1).	Br.	
(P39Z2)	2	Bushings.....	In nipples (P45C1).....	H. R. Fiber.	For terminals.
	1	do.....	In push button (P39AD2).....		
(P39AK2)	1	Buzzer, complete.	Pivoted below magnets on buzzer frame (P39AC).		Made up of 1 armature of magnet iron, 2 brass contact springs, 2 brass rivets, 2 steel rivets, 1 brass buzzer arm, 1 brass buzzer ball, 1 vulcanized fiber bushing.
(P39AS3)	1	Buzzer board.....	Secured to pistol cover (P39A1)...	H. R.	2.656 by 2.5 by 0.625 inches.
(P39AQ1)	2	Buzzer-board nuts.	Molded in front edge of buzzer board (P39AS3).	Br.	
(P39AP1)	2	Buzzer-board screws.	Engage in buzzer-board nuts through pistol cover.	Br.	
(P39AC)	1	Buzzer frame.....	Below magnets.....	Br.	Supports buzzer pivots (P39AH).
(P39AL1)	1	Buzzer-frame bolt.	Passes through magnet header (P39AE) and engages in buzzer frame (P39AC).	Br.	
(P39V1)	1	Buzzer-frame screw.	Passes through the buzzer board (P39AS3) and engages in buzzer frame (P39AC).	S.	
(P39AH)	2	Buzzer pivots.....	In buzzer frame (P39AC).	S.	
(P39AU)	1	Filler piece.....	Under retaining catch (P39B2)...	S.	
	1	Firing-pistol bracket.	Bolted to sight standard.....	Bz.	See dr. 7-3-20, rev. Oct. 1, 1909.
	1	Insulation.....	From binding post screw (P39W2) to magnet spool.	S. R.	
(P39AA1)	2	Magnet bars.....	In magnet spools (P39U3).....	Magnet iron.	
(P39AE)	1	Magnet header.....	Bolted to buzzer board (P39AS3).	S. I.	
(P39AR)	2	Magnet screws.....	Secure magnet header to magnet bar.	S.	
(P39U3)	2	Magnet spools.....	Rest on buzzer frame.....	H. R.	
(P45C1)	2	Nipples.....	Surround bushing (P39Z2).....	Bz.	
(P39N)	2	Pistol bolts.....	Top of pistol frame (P39C1).....	Bz.	Secure pistol frame to pistol cover.
(P39A1)	1	Pistol cover.....	Attached to firing pistol bracket.	Bz.	
(P39C1)	1	Pistol frame.....	Slides over pistol cover.....	Bz.	Pistol grip is formed on rear portion.
(P39AD2)	1	Push button.....	Seated in rear part of pistol frame above trigger.	Br.	
(P39AF)	1	Push-button gland.	Retains push button in seat.....	Br.	
(P39AG1)	1	Push-button spring.	Keeps push button in its rearward position.	Br.	
(P39R1)	1	Resistance spool.....	Embedded in back of buzzer board.	H. R.	
(P39B2)	1	Retaining catch.....	Riveted to front face of pistol cover engaging firing pistol bracket.	S.	Tempered.
	1	Retaining-catch end.	Riveted to retaining catch (P39B2).	S.	
	4	Rivets.....	In retaining catch (P39B2).....	I.	
		Rubber cloth.....	Wound on magnet spools (P39U3).		

Electrical firing and lighting apparatus—Continued.

FIRING PISTOL AS PER DRAWING 14-5-39—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(P39P)	1	Screw, wood.....	For resistance spool (P39R1).....	Br.	Platinum tip.
(P39Q)	1	Screw binding.....	For spiral (P39AJ1).....	Br.	
(P39Y1)	2	Screw contact.....	1 in binding post (P39J1) and 1 in binding post (P39X).	S.	
(P39T1)	2	Screw header.....	Secure magnet header (P39AE) to buzzer board.	S.	Platinum tip.
(P39G)	2	Screw-spring insulation.	Secure spring insulation (P39H4) to pistol cover.	Br.	
(P39AJ1)	1	Spiral.....	Secured to rear edge of buzzer board.	S.	
(P39AM3)	1	Spiral screw.....	In spiral (P39AJ1).....	Br.	Engages binding screw (P39Q) and spiral screw (P39AM3).
(P39AN1)	1	Spiral-screw nut...	Embedded in buzzer board.....	Br.	
(P39H4)	1	Spring insulation..	Secured to lower branch of pistol cover.	M. M.	
(P39L3)	1	Trigger.....	Pivoted in rear portion of pistol frame.	Bz.	Platinized.
(P39M)	1	Trigger pivot.....	In rear portion of pistol frame....	Br.	
(P39K)	1	Trigger spring.....	Secured to spring insulation by binding bolt (P39D1).	Br.	
(P39E2)	1	Trigger insulation.	On trigger (P39L3).....	H. R. Micinite.	To completely insulate binding bolt.
	1	Washer.....	Between binding bolt (P39D1) and pistol cover.		
		Wire.....	Resistance spools.....	G. S.	
	do.....	Magnet spools.....	C.	To decrease current in testing firing circuit so as not to fire primer.
		.....do.....	In magnet bar (P39AA1).....	C.

FIRING PISTOLS AS PER DRAWING 7-3-26.

	1	Binding bolt.....	In spring insulation.....	Br.	Hexagonal.
	4	Binding-bolt nuts.	On binding bolts.....	Br.	
	1	Binding post.....	In buzzer board.....	Br.	
	1do.....do.....	Br.	Insulated.
	2	Binding-post screws.	Securing binding posts to buzzer board.	S.	
	2	Binding-post cables.	From binding bolt No. 1 to binding stud No. 17 and from binding stud No. 13 to binding post No. 11.	C.	
	1	Binding stud.....	In buzzer board.....	Br.	Hexagonal. Special.
	1	.....do.....	In spring insulation.....	Br.
	1	Binding-stud nut.	On binding stud.....	Br.	
	1do.....do.....	Br.	Special.
	1	Binding screw.....	In spiral.....	Br.	
	2	Bolts, tap.....	1 in magnet header and 1 in spiral	Br.	
	2	Bolts, header.....	Securing magnet header to buzzer board.	S.	Made up of 1 bushing of vulcanized fiber, 2 steel rivets, 2 brass rivets, 1 brass buzzer arm, 1 brass buzzer ball, 1 armature of magnet iron and 2 brass contact springs.
	2	Bushings.....	In nipples.....	H. R.	
	1	Button gland.....	Retains push button in seat.....	Br.	
	1	Buzzer.....	Pivoted below magnets.....	Special.
	1	Buzzer frame.....	Below magnets.....	Br.	
	1	Buzzer-frame bolt.	Extends through magnet header to buzzer frame.	Br.	
	1	Buzzer board.....	Attached to pistol cover.....	H. R.	Special.
	2	Buzzer-board screws.	Attaching buzzer board to pistol cover.	Br.	
	2	Buzzer-board nuts.	On buzzer-board screws.....	Br.	
	2	Buzzer pivots.....	In buzzer frame.....	S.	

Electrical firing and lighting apparatus—Continued.

FIRING PISTOLS AS PER DRAWING 7-3-26—Continued.

Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
	2	Contact screws.....	In binding posts.....	S.	Platinum tip.
	1	Insulation.....	From binding post No. 10 to magnet spool, through buzzer board.	S. R. tube.	
	1	Leather insulation.....	On trigger spring.....		Sewed on with silk thread.
	2	Magnet spools.....	Rest on buzzer frame.....	H. R.	
	1	Magnet header.....	Bolted to buzzer board.....	S. I.	
	2	Magnet screws.....	Attaching magnet header to magnet bars.	S.	
	2	Magnet bars.....	In magnet spools.....	Magnet iron.	
	2	Nipples.....	In pistol cover.....	Bz.	
	1	Pistol cover.....	Slides into pistol frame.....	Bz.	
	1	Pistol frame.....	Slides over pistol cover.....	Bz.	
	1	Pistol bolt.....	Secures pistol cover to pistol frame	Br.	
	1	Push button.....	In rear part of pistol frame above trigger.	Br.	With glass point.
	1	Push-button spring.....	Holds push button in its rearward position.	Br.	
	1	Resistance spool.....	Embedded in back of buzzer board.	H. R.	
	1	Rubber cloth.....	Wound on magnet spools.....		
	2	Screws, spring insulation.....	Securing spring insulation to pistol cover.	Br.	
	1	Screw, wood.....	In resistance spool.....	Br.	
	1	Spiral.....	Secured to rear edge of buzzer board.	S. Br.	Platinum tip.
	1	Spring insulation.....	Secured to pistol cover.....	H. R.	
	1	Trigger.....	Pivoted in rear portion of pistol frame.	Bz.	
	1	Trigger spring.....	On binding bolt.....	S. Br.	Platinized.
	1	Trigger pivot.....	In rear portion of pistol frame.....	Br.	
	1	Washer.....	Between binding bolt and pistol cover.	Micinite.	To completely insulate the binding bolt.
		Wire.....	For resistance spool.....	G. S.	Silk covered.
		do.....	For magnet spools.....	C.	Do.
		do.....	In magnet bars.....	C.	Bare.

SAFETY FIRING SWITCH.

(P30F)	2	Blades.....	Attached to lever (P30T).....	{ Hard copper.	Are engaged between clips on safety firing switch clip base. 2.5 by 1.25 by 0.25 inches.
(P30E)	2	Blocks.....	Between blades (P30F) and lever (P30T).	H. R.	
(P30S)	6	Bolts, tap.....	For covers (P30P1) and (P30Q1).....	S.	0.75 by 2 inches.
(P30A)	3	do.....	For lever base to chassis.....	S.	
	2	do.....	For clip to top carriage.....	S.	
(P30N)	1	Bushing.....	In lever (P30T).....	Bz.	
(P30D)	4	do.....	Insulating blades (P30F) and clip blocks (P30J).	H. R.	
(P30J)	2	Clip blocks.....	In clip base.....	H. C.	
(P30G)	4	Clips.....	Riveted to clip blocks (P30J).....	H. C.	2 right, 2 left.
P30H)	1	Clip base.....	Bolted to under left side of top carriage.	C. I.	
(P30Q1)	1	Cover.....	Secured to clip base.....	S.	
(P30P1)	1	do.....	Bolted to stop.....	S.	
(P30T)	1	Lever.....	Operating on lever pivot (P30J).....	C. I.	
	1	Lever base.....	Bolted to left chassis.....	C. I.	
(P30R)	1	Lever pivot.....	Screwed into lever base and pinned.	S.	
(P30C)	4	Nuts.....	Secure clip block (P30J) and blades (P30F).	S.	
	1	Pin.....	Secures stop to lever base.....	S.	
	2	Pins.....	Between blocks (P30E) and clip base and lever (P30T).	S.	
	4	Rivets.....	Securing clips to clip blocks.....	C.	
	1	Spring cover No. 1.....	On lever (P30T).....	S.	
	4	Split pins.....	For nuts (P30C) of blades (P30F) and clip blocks (P30J).	S.	
	1	Stop.....	Riveted in bearing in lever base.....	C. I.	
	1	Taper pin.....	Securing lever pivot to lever base.	S.	

Electrical firing and lighting apparatus—Continued.

SAFETY FIRING SWITCH—Continued.

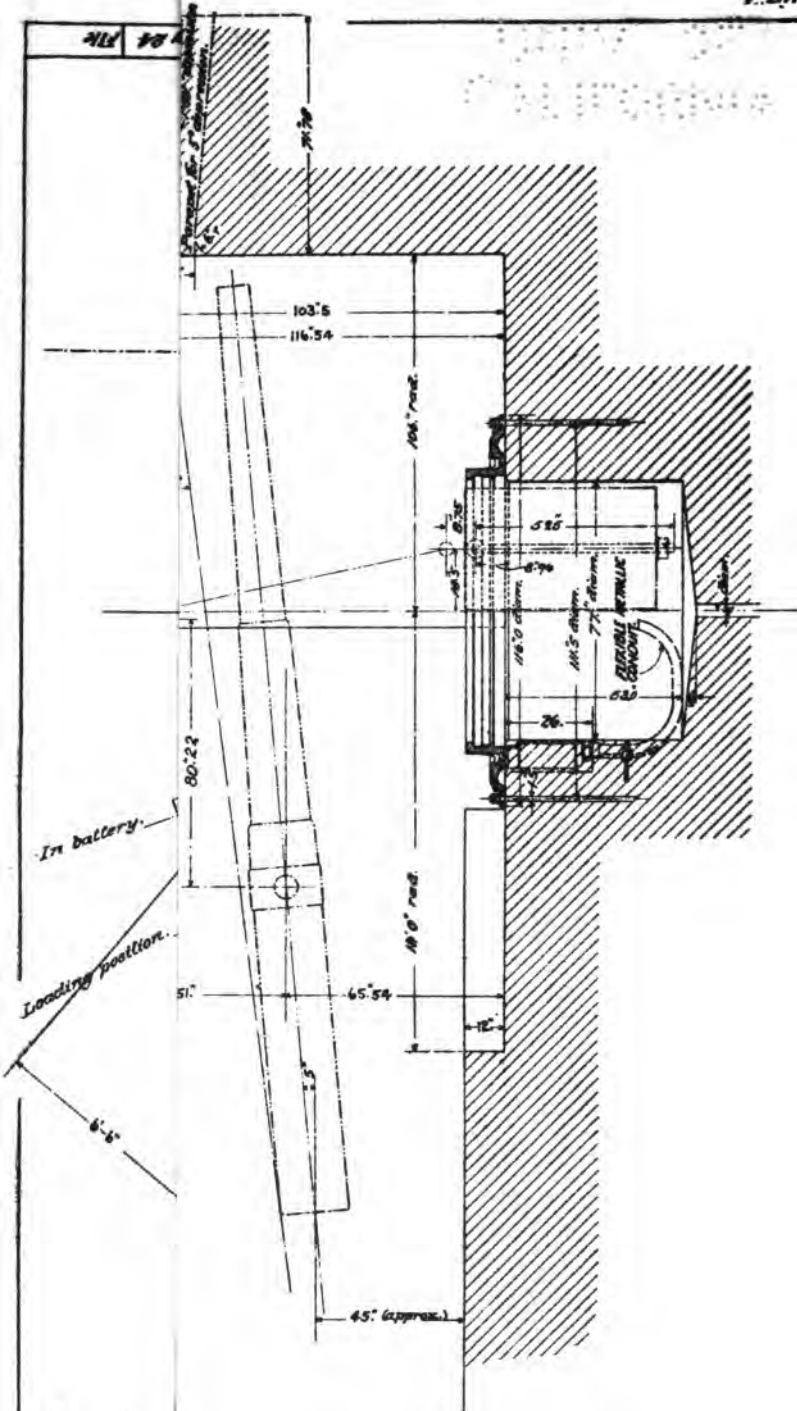
Piece mark.	Number.	Name of part.	Location.	Material.	Remarks.
(P45D1)	1	Terminal attachment.	In lever of safety firing switch....	.....	For securing branches of firing circuit to blades (P30F).
(P45E2)	1	.....do.....	In clip base.....	.....	For securing branches of firing circuit to clip blocks (P30J).
	4	Washers.....	Under nuts (P30C).....	S.	

Short truck.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
Axle brackets.....	Frame.....	Cast steel.....	2	.....	.....	.....	With pins.
Frame.....	On axle brackets and guide-wheel axles.	Rolled iron.....	1	.....	.....	4	With bolts and rivets.
Guide wheels.....	On guide-wheel axles....	Cast steel.....	2	.....	.....	.....	With bronze bushings and oil plugs.
Guide-wheel axles.	In guide wheels.....	Steel.....	2	.....	.....	.....	With split pins.
Handle.....	Frame.....	Ash.....	1	.....	.....	.....	With rivets.
Wheels.....	On wheel axle.....	Cast steel.....	2	With bronze bushings and oil plugs.
Wheel axle.....	In axle brackets.....	Steel.....	1	2	With washer.

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Approved:

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Lieut. Ordnance Dept.

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